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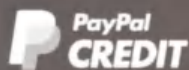
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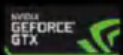


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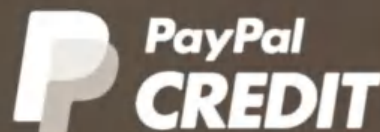
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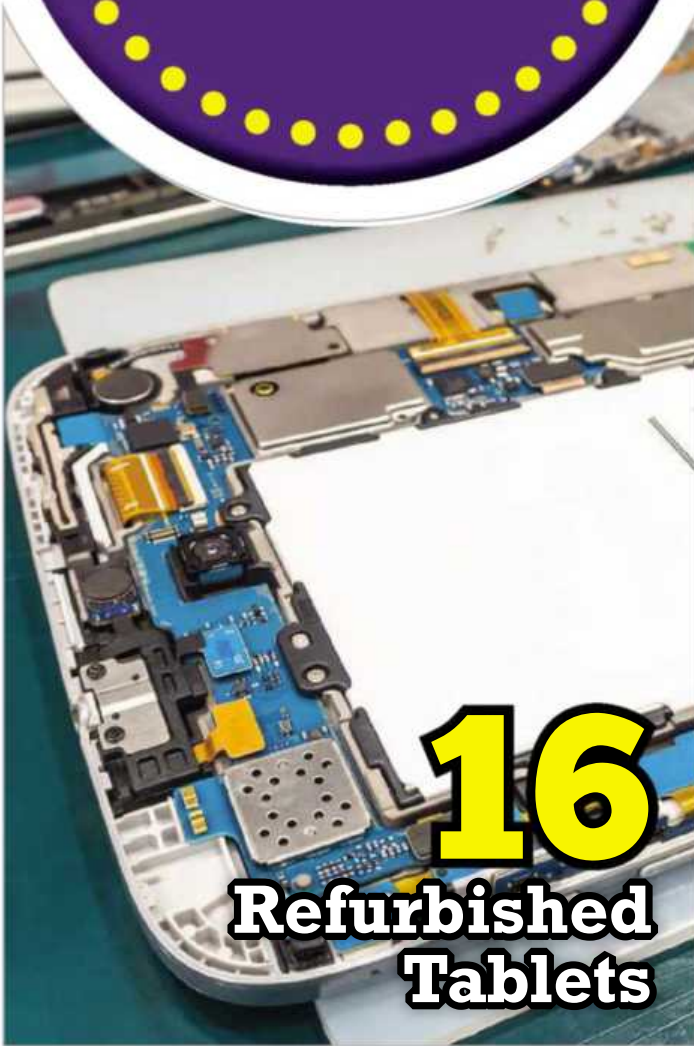
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Refurbished PC Guide

They may not be brand new, but refurbished computers deliver where it counts...

If you've decided you want to save money by buying a refurbished PC, you might be wondering where you even start. Refurbished computers vary massively in price and performance, and if you're used to buying new hardware, you might not even know where to look. In this guide, we'll give you all the information you need to buy a refurbished PC – as well as helping you decide whether or not it's even right for you.

Refurbished Desktops

Refurbished desktop systems can vary hugely in quality and construction. Desktop computers are the easiest to build and modify, so if you buy a refurbished PC, you have no clear way of knowing how extensive (or not) the modifications are. If you buy from a manufacturer or retailer you should have a fairly good idea of its provenance, but second-hand or third-party sales are much more of a grey area.

The good news is that refurbished desktops are normally incredibly cheap, and their flexibility makes them the easiest to improve and modify yourself. It's unlikely that you'll find a desktop system refurbished to the specification you were looking for, but at the same time it's very easy to take a refurbished system that's close and make the improvements you'd like to have seen – something that's next to impossible to do with laptops and tablets.

As with all refurbished hardware, desktop systems are tested before they go on sale, but with so much about a system that might go wrong it's hard to be clear what condition it was in before it went on sale. If the desktop was a system returned because of a faulty component that's been replaced, then it should be as good as new.

If someone buys a custom desktop then changes their mind about actually wanting it, it's usually easier to sell the system as open-box or refurbished, rather than dismantle the hardware completely. Retailers and manufacturers would usually prefer to discount the system, remove anything with enough second-hand resale value, and recover the cost of construction by selling it on.



Whether you buy from a manufacturer or a retailer, refurbished desktops are far more trustworthy than a normal second-hand desktop that you might find on eBay or some other third-party sales venue. The main thing you can expect is some level of after-sales support, which you won't be entitled to if you buy person-to-person.

The downside of this is that when you buy a refurbished desktop, they're going to lose most of their already-discounted value. Don't buy a desktop system if your plan is to make an investment or flip it for profit. Only buy a desktop system over any other if you're planning to make use of its extra power and customisability (e.g. it's a gaming system) or if you're planning to use up as much of its lifespan as possible.

When you've bought a desktop system from a refurbished source, all you really need to check is that it isn't going to fall

“ Although refurbished systems are worth looking at when you're buying a new PC, not everyone wants to replace their entire computer ”

over any time soon. We'd recommend checking the hard drive and RAM for integrity, and maybe doing a stress test on the CPU and graphics chipset. As long as those are fine, you can at least be sure that your system will remain in working order in the short term.

Refurbished Laptops

If you've ever owned a laptop, you'll know that they aren't very customisable. There are some parts you can replace, like batteries, keyboards and even screens, but the most important components are integrated into the motherboard. It is possible to replace some laptop parts at home, but if you tried to replace the core components – the motherboard and CPU – you'd essentially have a whole new laptop.

For this reason, refurbished laptops have a slight edge over refurbished desktops. Even those that have been taken apart and repaired have been handled by either the manufacturers or someone who has a very good idea of what they're doing. That creates a level of trust in the performance and quality of repairs that might not be there with more complicated desktop refurbishes.

Generally speaking, it's a good idea to buy a refurbished laptop in any case where you don't require the most high-end unit available on the market. You get the choice of spending less of your budget on the system you want or getting better specifications for the money you spend. Either way, it's better value. Looking for a well-known brand is still important, since that determines the baseline level of quality, and in some cases you'll still even have the manufacturer warranty.

As usual, though, the ambiguity of the term 'refurbished' can be an issue. A refurbished laptop could be one that has had faulty parts replaced with fresh examples. It might be one that has had a cracked screen replaced with a completely new one. Or it might be a second-hand one that has been reformatted, put in a new box and sold as a reconditioned unit. There's no way to be certain what route it took back to the shelves unless the retailer tells you.

At the minimum, a refurbished laptop should at least have had its hard drives wiped and its exterior given a good clean, if not replaced entirely. Make sure your expectations are tempered, though. Laptops that have been used are never going to look the way they did out of the factory, whether it's dust in the hinges or scratches on the case.

As with desktops, you may find that if you buy a refurbished laptop, you're unable to change its specifications as you would with a completely new model. This might not be a problem if you're the sort of person who doesn't worry too much about the specific components in their computer, but if you're after a particular combination of brands and hardware, you might be waiting a long time until the right refurbished laptop comes around. As we've established it's difficult to upgrade a laptop yourself, so don't buy one unless it's exactly what you want or you don't care what's inside it.

The good thing about laptops is that even refurbished ones hold their resale value pretty convincingly. Admittedly, they did so much more reliably before tablets started knocking around the market, but if you want to resell a laptop system – even a refurbished one – there probably won't be a lot of difficulty in doing so.

Refurbished Components

Although refurbished systems are worth looking at when you're buying a new PC, not everyone wants to replace their entire computer. If you're the type of person who prefers to upgrade rather than replace, it's still worth looking out for a bargain – and refurbished or other open-box components might just provide the biggest bargain of all.

But are they a false economy? In many cases, probably not, but it doesn't hurt to learn where the risks are concentrated when you're buying hardware that has been handled before.

When it comes to PC components, hard drives are by some distance the most likely to fail through wear and tear. Not only do they contain moving parts, but they're subject to constant use and are especially vulnerable to dirt that could be introduced through normal use.

The problem for anyone looking at refurbished systems is that a hard drive isn't really user-serviceable. The extreme conditions required to repair a hard drive mean it's cheaper to buy a new one than fix a broken one. This is why data recovery has a literally forensic quality: expose a drive's inner workings in anything other than a specialist facility and you can only make it worse than it currently is.

A typical hard drive refurbishment is actually just a drive that has been wiped and tested for bad sectors. Theoretically, it's as good as new. In practice, it'll have a much shorter life than a new drive would. Bad sectors can even appear on new hard drives in a virtually spontaneous manner, and the more a hard drive has been used, the more likely they are to appear.

The upshot is that if you're buying a refurb system of any kind, we'd strongly advise looking at a new hard drive even if the existing one is fully tested. If you're looking to buy a stand-alone refurb drive, we'd suggest that you simply don't. Hard drives are so cheap that there's not a lot to gain financially, and a lot to lose in terms of the precious, irreplaceable data you store on them.

SSDs, on the other hand, are still a very expensive way to buy storage, so refurbished versions can represent a significant saving. Refurbishing an SSD involves much the same process as refurbishing a mechanical drive: the storage will be wiped and tested for errors, and the firmware may be flashed with a newer version to bring it fully up to date. It's possible you'll see the case



get replaced, but the actual storage area – in this case, the NAND flash – is unlikely to get an overhaul.

Unlike mechanical drives, dust and physical wear isn't as much of a problem with SSD drives, but flash memory does still fail after a certain number of writes and rewrites. It might look indistinguishable from a fresh SSD, but the wear will still be there, and it can't be reduced.

The complexity of graphics cards tends to mean that refurbished examples turn up with reasonable regularity, since there's a lot that can go wrong and plenty that can be repaired as well.

The good news is that most graphics cards parts can only be replaced by the manufacturer, which guarantees good-quality repairs, and those parts that can be replaced by users aren't exactly critical in the first place.

For example, only manufacturers can replace the GPU or memory chips on a graphics card. Users may be able to repair a graphics card's heatsink or fan, but assuming they're guaranteed to arrive in working order, this shouldn't present much of a problem. It's entirely possible that 'refurbished' means it's just been given a clean and paired up with new cables and accessories, in which case you're getting a great deal. Graphics cards don't usually wear out under normal use, so capabilities aside, it's probably as good as new.

There's at least one good thing about refurbished graphics cards, though, and that's how inessential a graphics card is to the normal operation of any system at the moment. If you're running a recent Intel or AMD CPU, there's a strong chance it has an on-board GPU that you could use temporarily should your graphics card fail. This makes the risk slightly easier to swallow: if the card fails, you'll still have immediate access to your system while you claim your refund.

Finally, RAM. Memory is almost unique in being both incredibly cheap but critical to a PC's operation, and a bad stick of RAM can cause problems and instability that might look like the result of a fault in literally any component of your system. Even if you could buy refurbished RAM, it would scarcely be worth saving the money to do so.

As it happens, you can't buy refurbished RAM, purely because no one's actually selling it. At best, you may find open-box RAM, but even then it's probably not going to offer a considerable saving. Anything more than £5 off retail would be excessively low.

When buying RAM second-hand it's always worth checking for a returns policy, and definitely running it through some rigorous testing when you get it. Don't just check it for data integrity either. Do a stress test. If there are any serious flaws, they should become evident as soon as you get the heat pumping into it, and it's better to realise sooner rather than later.

Where To Buy Refurbished PC & Components

One of the main disadvantages to shopping for refurb systems is that you don't get to pick what you buy, because availability is on an individual system-by-system basis. You can either take the bargain you spot or wait for the next to come along, but there's not a lot of wiggle room otherwise. The best way to get the hardware you want – or at least something close to it – is to check as many outlets and retailers as possible.

If you know exactly what type of system you want, then your best chance of finding it refurbished is to stake out the manufacturer's webstore. Although under normal circumstances manufacturers tend to sell goods at the RRP, making them expensive compared to the majority of retailers, this is one case where you can get a bargain by buying direct.

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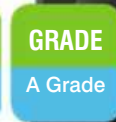
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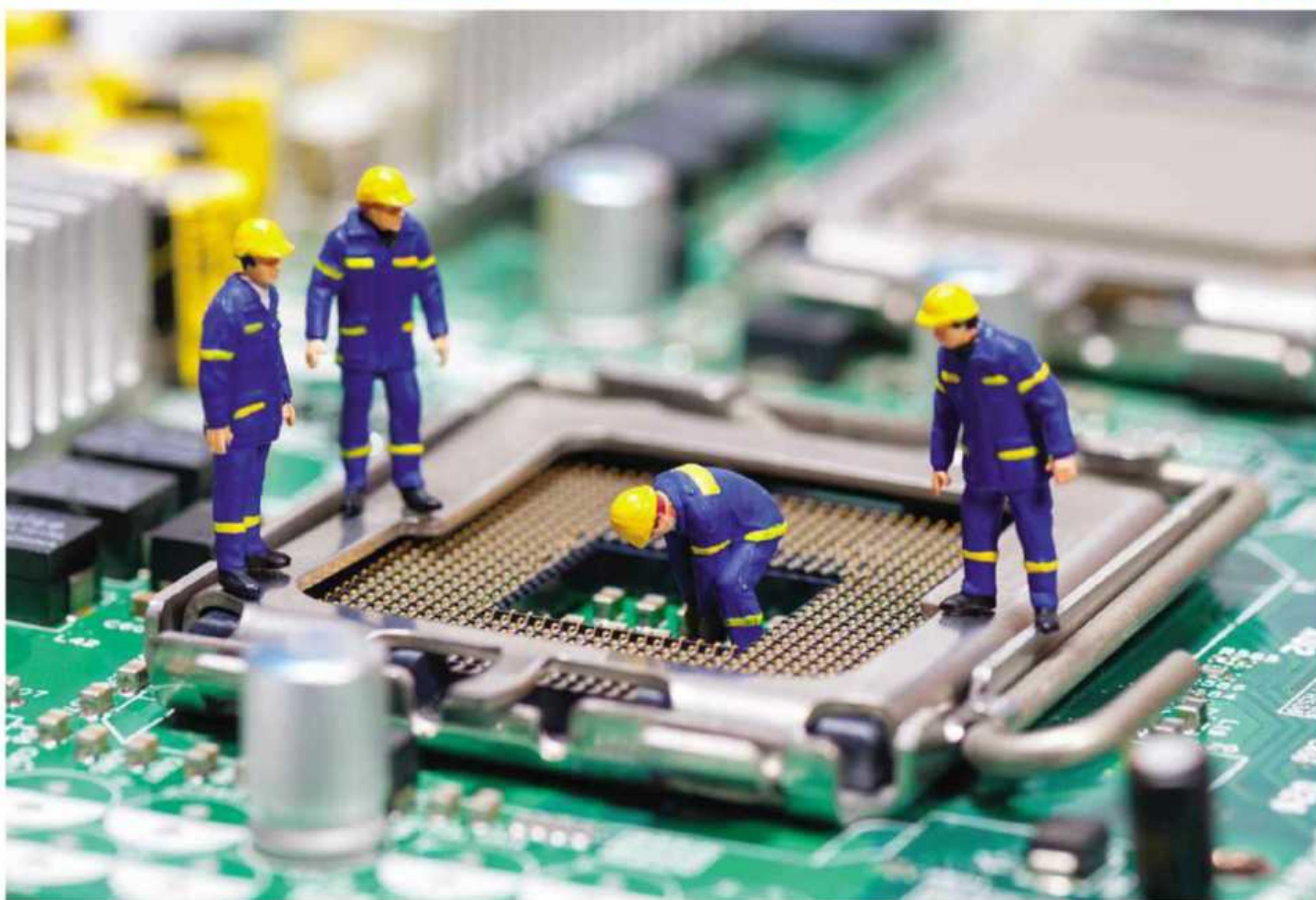
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Generally, manufacturers don't sell used items through their official store, but take a look around their website and you'll almost certainly find a section for outlet goods, which includes end-of-line and reconditioned hardware. It's not always easy to find, but if you stick their name into Google along with 'outlet store', it should turn up.

When systems (and components) are returned to the manufacturer, they'll recondition it for sale, and the process is usually very straightforward. Usually, it'll involve swapping a faulty component for a working one or performing a factory-reset on the software, at which point the item will qualify to be sold as refurbished or reconditioned.

Buying refurbished hardware directly from manufacturers is also a good way to ensure it's in good working order. When hardware is being resold by the people who make it, you can guarantee it's been repaired using genuine components and by genuine engineers – and at the very least you can be sure it's gone through the same QA process as a new item, if not an even more rigorous one.

The biggest disadvantage of buying refurb hardware from manufacturers is that the discount isn't going to be fantastic. Since manufacturers tend to sell at the retail price, the discount will only be relative to that.

If you're more interested in getting a good price than a good-quality sale, the most obvious place to look for second-hand systems is on eBay. Here, you can find desktops and laptops from the full range of the secondary-market spectrum, and since it's barely a step above an online car boot sale, you can get an excellent bargain as well as a wide choice.

As with everything on eBay, a bargain isn't guaranteed, though. The newer and more desirable an item is, the greater the likelihood of it selling for market value. You also have to deal with the inherent unreliability of person-to-person

“ Generally, manufacturers don't sell used items through their official store, but take a look around their website and you'll almost certainly find a section for outlet goods ”

transactions and potentially long waiting times. There's a reason you can save a lot of money: you also assume a lot of risk and inconvenience.

Although there are other second-hand markets you can try, like Amazon Marketplace or Craigslist, eBay is probably the best bet. Its large user-base gives you a good selection of items to buy, while the built-in feedback system and close PayPal integration offer some protection against fraud. It's not foolproof, but it's as reliable and safe as any second-hand transaction can be. [mm](#)



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Refurbished Tablets Guide

There are plenty of cheap tablets around already, but if you want a high-end device, then getting a refurb unit can make it affordable



There's a lot to love about a decent tablet PC. They're compact and lightweight enough to be portable from room to room, but heavy-duty enough to pack in serious computing power. Despite what marketers might think, the natural home of most tablets is in bedrooms and lounges, where they can be picked up and put down at a moment's notice in ways that larger PCs – even laptops – can't be.

The only problem with this is that despite being casual devices, they have intrinsically non-casual prices. Only the cheapest, most corner-cutting devices comes in under £150, and if you want something with real power (or at least, decent screen size) you have to spend upwards of £300 to get it.

But there's some good news: if you're willing to accept a device that's only nearly new, rather than fresh from the factory, there are huge savings to be found. The rapid release schedule and high desirability of tablets means that the secondary market is surprisingly healthy. Refurbished devices that have been used, returned and put on sale after a good internal scrubbing (typically by the manufacturers themselves) can be picked up for a considerable saving.

“ Perhaps the best thing about tablets is that they're currently very desirable items, even second hand ”

You might understandably be hesitant about the idea of buying 'old' consumer electronics, though, so to make sure you have all the information you need before deciding on a refurb tablet, we've looked into whether or not they're really worth the money and what you can expect if you decide to go this route.

Refurbished Tablets

Unlike desktops and laptops, refurbished tablets are usually good value and tend to be in like-new condition, because virtually the only way to get them refurbished is by returning them to the manufacturer. It is possible for third-party organisations to perform a repair job, but even then it's only on minor aspects like the screen and battery.

If you open up a tablet's shell, all you find inside are non-modifiable electronics. That means on a refurb, the most important components should still be in good condition. As long as you can get past the idea that you're not the first person to be swiping your fingers across a screen (unless, of course, the screen was replaced!), then the discounts you can pick up are significant and have no practical downside. Manufacturer refurbishments even come with the original warranty intact.

The limited number of system configurations compared to desktops and laptops makes it much easier to check what sort of deal you're getting. Before you buy a refurbished tablet, check the price of a new model to make sure the discount is good enough. You're looking for 15-20% for a good price, and maybe as much as 40% once you reach the high end of the market. On older devices, the discount can be even bigger. If you want a tablet for under £75, refurbs of items just a couple of years old will sell below that price.

One thing you should be aware of is that refurbished tablets might be older models than the latest ones on sale. This can potentially lead to problems with both software and hardware compatibility. You might be prevented from using certain features of software that you were expecting to be available and, if nothing else, the operating life of the device will be significantly shorter than a new one. The average tablet is probably good for about three to four years, but unlike desktops and laptop systems, there aren't any ways to improve tablets when they start to fall below the market baseline.

If you do buy a refurbished tablet, there are a few things you need to check before you can consider your transaction complete. In particular, you should check the battery holds its charge well. It's also worth checking that the screen responds properly to your touch and that it has no major problems with dead or stuck pixels. Remember to check the microphone, the speakers and any cameras too, as these components could be faulty for weeks before you actually noticed.

Perhaps the best thing about tablets is that they're currently very desirable items, even second hand, so should you come to resell them, you're likely to get close to your original outlay – certainly much closer than you would with some other devices. This desirability also means that refurbished tablets don't hang around long. If you think a refurb tablet is for you, don't waste time deliberating. As soon as you spot one on sale, you should buy it before someone else does!

Tablet Advantages & Disadvantages

The primary advantage of a refurbished tablet is, of course, that it's a lot less expensive than a new one. While savings can run as high as 50% at times, the discount is more typically in the region of 20% – which is still a hefty amount off a device that is otherwise likely to be fixed at retail price across multiple outlets.

What makes this particularly good news is that if you buy through an approved refurb retailer, you'll get extras that a typical second-hand sale wouldn't necessarily include.

For instance, with approved refurbishments, you can be sure the hardware has been tested and guaranteed in working condition, which isn't the case with a standard second-hand purchase. This also means that the tablet comes with a decent set of consumer protections attached to it. Most retailers offer the same right of return on refurbished goods as they do on new hardware, and if they don't, that's a warning sign to you that the hardware is potentially untested and may be faulty.

The other advantage is that unlike basic second-hand sale, the hardware will definitely have been set back to the factory state, or at least as close to that as is reasonably possible. The software will have been restored to its default settings, and any hardware or accessories that should be included will be replaced. The refurbishment process can be as minor as swapping a damaged USB cable or dented box with a fresh one, or as major as replacing the entire screen and case. Second-hand tablets are likely to have at least minor scratches and signs of wear, but a refurbished one might look like new.

There are a few disadvantages when it comes to buying refurbished hardware in general, and most of those revolve around the uncertain provenance of the device and its replacement parts.

Unless you buy from a manufacturer-licensed refurbishment program (or better still, the manufacturer itself), it's impossible to know whether their replacement parts are the genuine article or a cheaper, third-party alternative. Screens, in particular, have been known to be replaced with flimsier



versions that shatter and crack more easily, and while it's not particularly common, faulty batteries have been known to explode as a result of poor manufacturing.

Of course, neither of those problems are especially likely. They're just impossible to discount entirely. The majority of refurbished tablets are sold by reputable retailers and have zero functionality problems or safety issues. The main thing you should worry about when buying a second-hand tablet is simply one of age. Even with new parts, these are devices that, by definition, are further through their life cycle than

“ If you spot a model even vaguely close to what you want, you shouldn't wait ”

brand new devices. If they're older generation, they're also nearer to the end of their supported lifespan, if not their operational one.

Unlike second-hand PCs, hardware reliability isn't a huge problem, because most tablet components last for more time than the device is likely to be used for. Batteries are the exception, but these are usually replaced during a refurbishment.

What is of concern is hardware support. The fast pace of platform development means even if you buy the latest device, you might find that the manufacturer won't support an update

to the latest version of its operating system a year down the line. Many tablets languish on old versions of Android because their manufacturers won't release the official updates needed to enable users to install the latest version. And that's on new devices. Refurbished ones already have months, if not years, of declining support behind them.

Even if you can install the latest software, you might discover that your hardware isn't good enough to run it useably or take advantage of the new features. You might discover that a hardware overhaul has rendered your tablet incompatible with the latest accessories, like iPad users did when Apple switched from 32-pin to Lightning connectors. Maybe it doesn't run the latest version of Android. You can find out some of this in advance, but ultimately it's all part of the trade-off you make when you decide to save money on a refurb rather than buy new.

Ultimately, the risk of support being cut off depends on the age of the hardware, so take that into account when you buy a refurbished item. It's worth pointing out that just because manufacturer support ends, the device doesn't become unusable. If it does everything you want already, you might feel sore about missing out on new features, but you won't actively lose money because of it.

Where To Look

If you want discounts on tablets, you've got two places you can realistically find them. Retailer websites are a pretty safe bet, because any refurbished item that appears there will probably have required only rudimentary repairs, like a new power lead or other accessory. Since tablets can't generally be repaired by sales outlets, you'll find that they probably didn't need

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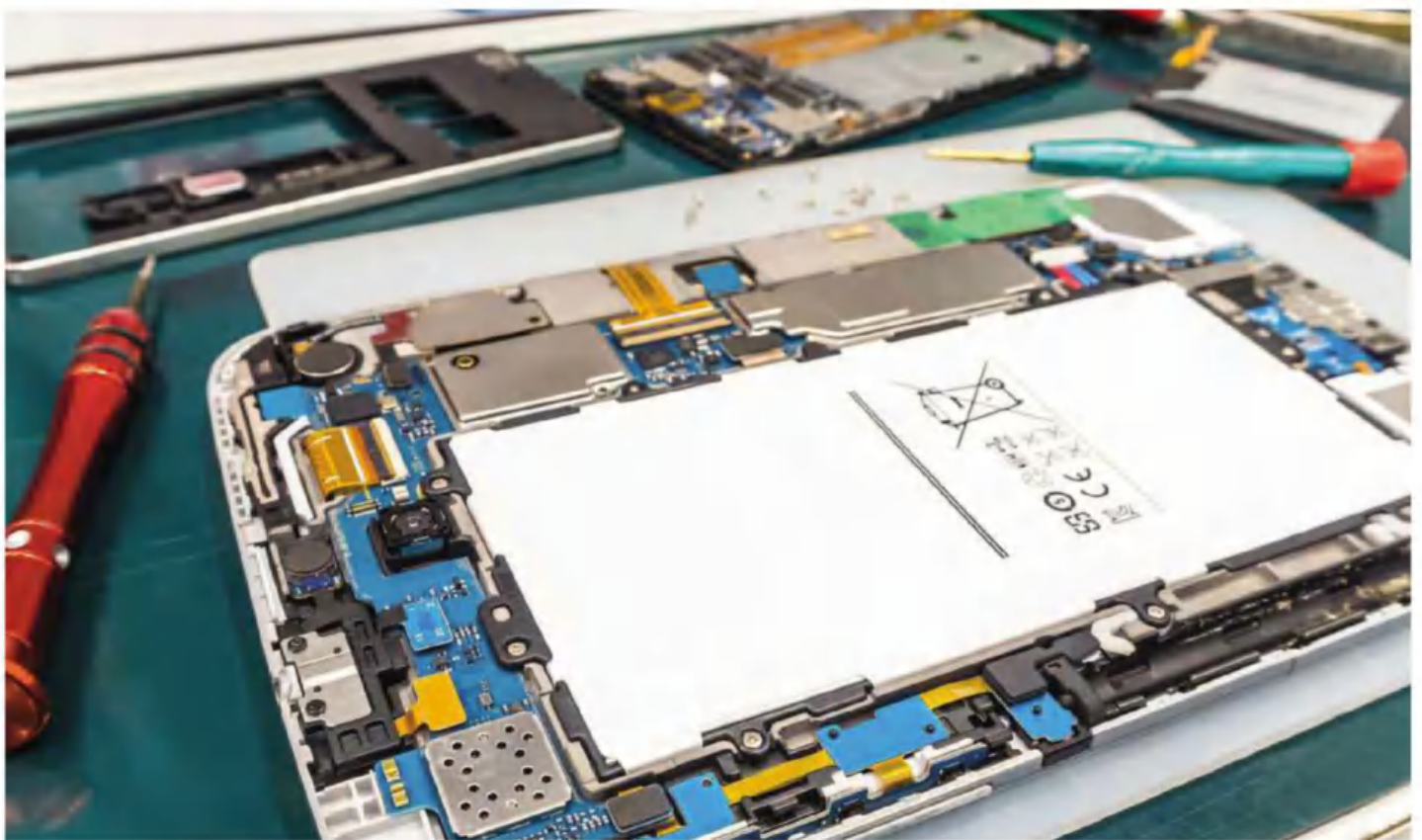
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A Note About iPads

We should point out that if you're looking at refurbished tablets, iPads are a special case. There's no question that if you can find an officially refurbished iPad, you should definitely buy it instead of the same model new.

That's because Apple's refurbishment program automatically replaces the accessories with new ones, fully tests the hardware and performs a complete replacement of any damaged or faulty components, with a default replacement of the screen and case. The only way you even tell an iPad is refurbished is because the box says so – presumably to stop third-party retailers buying them cheaply and then selling them as new. They're simply that good.

The only reason you might not do this is because of their availability. Apple's official discount store, which exists tucked away on the main Apple Store website, has only limited stock. It's extremely hit and miss as to whether you'll find the hardware you want. Essentially, you either have to have very loose requirements or a fair amount of patience to buy refurbished Apple hardware – but when you do, you'll be well rewarded.

However, this advice doesn't apply if you buy refurbished Apple hardware from non-approved vendors. Apple won't even look at devices that have been unofficially repaired, so if you're set on joining the Apple ecosystem, you shouldn't either. Official refurb, by comparison, give you a warranty as good as if you'd bought the hardware new and full access to in-store Genius Bar support. We don't necessarily agree with the way Apple conducts its business, but that's the reality. Stick with the official outlets and you'll be fine.

much repairing at all. Those that did will (or at least should) be marked as manufacturer refurbished so you know the parts are official, genuine and working.

“ Just because manufacturer support ends, the device doesn't become unusable ”

You should be aware that the range of quality is wider than manufacturer outlets, though. Where Apple or Sony would replace a scuffed case, a retailer might just knock £50 off the price and sell it as open-box. The risk of buying faulty goods isn't zero either. It's possible that someone found a tablet to be faulty and returned it, only for the retailer to place it back on sale because they couldn't replicate the problem. You've got no guarantee, so check the returns policy carefully.

Most popular retailers have clearance sections, though some run their outlet store through eBay instead of their regular site. Ebuyer is known for its low prices, so any bargains in its clearance section (goo.gl/HKf09) are both sparse and extra-desirable for being so cheap. Novatech also has a clearance store (goo.gl/94ifhU) with an extensive list of products.

With tablets in particular, availability is a much bigger issue than with other types of hardware, so if you spot a model even vaguely close to what you want, you shouldn't wait. The opportunities are much less frequent and much more sought after. You'll probably have to check often to find what you're looking for, and be ready to strike when it's there. All we can do is wish you good luck! [mm](#)

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In Focus

One of the leading companies in 'like new' technology in the UK is MicroDream, a firm that started in 2009. It brings in ex-corporate computers, fully inspects and tests them, refurbishes them and cosmetically upgrades them too, so they feel new. You can then buy them at that stage or take advantage of the many customisation options and upgrades MicroDream also offers.

Then machines are preinstalled with genuine Microsoft software, and MicroDream also adds a hardware test results booklet and a special 'how to get started' guide. It's this level of attention to detail that's helped MicroDream enjoy its success.

But the MicroDream service doesn't stop when you receive your order from the firm. It then backs up all of its laptops and desktop machines with a 12-month limited warranty. And, using the independent TrustPilot service on its website, it boasts of thousands of happy customers leaving feedback.

You can find out more about MicroDream at its website (www.microdream.co.uk), and that's where you can find its range of high-spec computer systems at a fraction of the price compared to brand new!



Refurb Experts

We speak to two experts in the refurbished technology market about the benefits to customers...

More and more of us are turning to the excellent deals in the refurbished market, and with good reason. Prices are lower, reliability is good, there's support on hand, and much more beyond that.

But why has the refurb market grown so much in recent years? "People like to own the latest devices and are more dependent on technology in their everyday lives," Philip Marlow, of iPhone Repairs & Spares Ltd, told us. "Finances are often stretched when paying for everyday essentials, but purchasing refurbished devices allows them to access the same luxuries as others at a significantly lower cost. The refurb industry has grown to meet this demand, providing devices that represent the same quality at a much lower price than a new product."

What's more, the technology we're buying is lasting longer than ever too, and that goes for refurbished products as well. That said, there's a contrast between how long a business will keep using a purchase and how long a consumer will. "Consumer device lifespans seem to be much lower, while business device lifespans seem to be increasing," Nick Hill of SH Computers told us. He added that "We are seeing much longer timespans for business upgrade schedules, which appears to be fuelled by Windows 7 and higher remaining backwards compatibility with most existing devices."

Refurb technology isn't all about computers, either. As Philip Marlow told us, "The smartphone refurb industry is profiting from much higher demand for the latest products at the lowest cost possible. A device with a damaged external housing is still likely

to contain fully working expensive internal components, creating an opportunity to purchase them at a low cost, and refurbish them to the highest standard for our customers. These savings can then be passed on to the consumer, allowing them to access the best technology within their budget."

You can find SH Computers at www.sh-computers.co.uk and iPhone Repairs & Spares Ltd at iphonerepairsLtd.co.uk.





10 Uses For a Refurbished PC

Looking for reasons to give your computer a refresh? Look no further

When you buy a new PC, there's always a big question to be answered: what becomes of the old one? Sometimes you can cannibalise it for parts, but even after that, you often have a near-complete PC lying around just waiting to be thrown in the tip. Of course, refurbishing it is an option, but first you need the incentive.

To try to give you a reason to buy that extra RAM, fit a spare hard drive or just pick up a cheap monitor and bring your unwanted system back to life, here are ten things you can do with a PC once you've refurbished it.

1. Use It To Play Old Games

If you've upgraded your computer, there's a good chance that it's because the old one simply isn't capable of playing new

games. But that doesn't mean it's completely useless as an entertainment system. There are a couple of ways you can keep using it to enjoy gaming.

The first is to use it as an emulation system. Load it up with emulators and ROMs of all your favourite titles, buy a decent controller and then hook it up to a monitor or TV for some old-school gaming fun. Any remotely modern PC should be able to emulate the consoles and computers of the past to a more than playable speed, and a ton of games means you'll never get bored of sifting through the backlog. Who needs a £200 graphics card anyway?

Of course, if your favourite games are a little more recent than 8-bit consoles and 16-bit computers, you could take the opportunity to install a Windows 95/DOS combination on your

refurbished system instead. The recent shift to 64-bit computing means there are loads of old games that no longer work with the operating system and software on a modern PC, so installing older versions will allow you to enjoy the classics of the past far more easily. All you need is a spare monitor, keyboard and mouse, and you'll be blasting your way through *Quake 2* or *Red Alert* like the past 20 years never happened.

2. Turn It Into A Media Server

If you have a lot of videos or music to watch, it can be useful to have them on a different PC to your main system. Having a spare, dedicated media server means it can remain switched on and attached to your network, serving multiple devices without the associated resource drain getting in the way if you're trying to work or play games.

Media servers are generally cheap to build; you just need to make sure there's a decent hard drive in there so you can copy

“ One of the big problems with smartphones, tablets and other SSD-based devices is that their storage space comes at a huge premium ”

your media onto it. After that, you just need a media server front-end like Plex, Kodi or Tversity (or even iTunes) to run so other devices can request to stream the content from it.

If you're really smart, you can also install some kind of VNC client, so once it's set up, you don't even need to attach a monitor. Media servers should be relatively stable given how little work they're called on to do, but if you ever need to reboot it, you can just log in remotely, rather than drag a spare keyboard and monitor over to wherever it lives. Simple.

3. Make A Linux PC

Have you ever wanted to get out from under the thumb of Windows but never quite figured out how to make the leap to another operating system? Well, if you have a spare computer around, it's the perfect opportunity to wipe off the stains of Microsoft and give yourself licence to try out the alternatives in a safe way.

Linux is the obvious choice, because most versions are completely free and can be obtained relatively quickly through a simple download. Linux's version requirements are much lower than Windows', so you'll be able to use an old PC without worrying about the specs being too low.

When you have it loaded onto a USB key or CD, you can boot and install it in minutes – and from that point on, all you have to do is tinker and prod it until you're confident enough to use it full time. If anything goes wrong, you'll be able to just wipe it and start again, since it won't have anything on it that you can't afford to lose.

The bad thing about setting up this kind of PC is that you'll probably need to buy a full set of spare peripherals, including a keyboard, mouse and monitor – though you could potentially avoid it by swapping over your main ones, inconvenient as that might be.

4. Hand It Over To A Beginner

Not everyone needs a PC that's capable of running the latest software at the fastest speeds. If you have a PC that's still in working order, there are plenty of people who might like the opportunity to learn how computers work and what they can be used for without shelling out loads of money on a brand-new system.

For example, the best way to learn how to build a PC is by taking apart an existing one and then seeing if it can be put back together so it works. Similarly, if you've never had your hands on your own desktop system, the chance to learn how to check your email can't be overestimated.

Who you give it to is entirely up to you. It could be a child just old enough to get interested in computers, an adult with little to no first-hand experience of their own, or a pensioner looking to get up to date with technology. People who haven't upgraded their PC for a while might just appreciate the chance to run something a little more modern. You'd be surprised, when you ask around, how many people are still banging away on Windows XP. Finding a home for a working system isn't difficult at all.

5. File Server

One of the big problems with smartphones, tablets and other SSD-based devices is that their storage space comes at a huge premium. Even on a desktop PC, SSDs are considerably smaller than the mechanical hard drives most of us are used to, and the extra speed only makes up for that to a point.

To get around this, you could create a file server. File servers are similar to media servers, but rather than streaming video and music, they contain all different types of files: photos, documents, basically anything you might want to access but which it would be inconvenient to sync across multiple devices.

If you're really smart, you could even set up your file server so it's remotely accessible over the internet. That way you essentially expand your smartphone with all the extra storage of a desktop system without having to spend any extra money. All you need is an internet connection and your files can be reached across the globe.

The only downside of file servers is that if they go belly up, they can cause serious problems with data loss, but buy a pair of hard drives and run them using RAID mirroring, and you should avoid any major problems.

6. Set Up A Network Accessory

When home networks are getting so crowded and yet so important, you can sometimes encounter problems with devices that can't get a strong enough signal or don't accept a wireless connection, or any number of other related difficulties.

The thing about PCs is that they're more versatile than routers. They can act as repeaters, access points, firewalls or any number of other things. If you have a TV set-top box or games console that doesn't run a wireless connection, you could use a PC as a bridge to connect them to your wireless network. If you want to let people access your wi-fi without giving away your password, it could run a separate, restricted access point that's easy to turn on and off. There are tons of extra things you could do.

Of course, it's debatable whether it'd be worth the cost; just buying the necessary network hardware might cost as much as a dedicated network accessory, and it's a lot more power hungry. But if you already have the hardware and the system available, you can easily turn an old PC into a multi-talented networking controller whatever it is you need.



7. Run a Distributed System

From Folding@Home to Bitcoin mining, distributed systems are a great way to put your extra CPU cycles into something that might pay back, both directly (if you're mining cryptocurrency) or more nebulously (your protein-folding research probably won't save your life immediately, but the general efforts could one day).

Whatever your preferred area of interest is, there's probably a distributed system around that's capable of utilising your old CPU cycles. Some versions of the software even use your GPU, so if your refurbished system contains a graphics card, it's even more useful.

The main thing to be aware of here is that if you do this, you're doing it out of the goodness of your own heart. Even mining bitcoins will result in a net loss on the power consumptions used, and part of your internet connection's bandwidth is going to be used up sending data back and forth too. At a stretch, you could say that at least a PC that's running will generate heat that would warm your room up – but then that's a very thin benefit compared to the cost of funding things out of your own pocket. But hey, at least you're putting an old PC to use instead of leaving it on the scrapheap.

8. Run A Game Server

Running a server for your favourite game is a great way to create a private, shared space that can't be interrupted by

gamers who might cause trouble for you or make the game unenjoyable by being so far out of your league that you can't actually play against them.

The benefits of running your own dedicated server are numerous. First, it means you don't get any resource drain on your system when you try to play, as you would if you were

“ Running a server for your favourite game is a great way to create a private, shared space ”

running a game and hosting the server on the same machine. This way, your client and the game's server both get the benefits of a full-power system, and because the game won't actually be rendering on the server machine, it can get away with much lower specs and still provide a decent experience to players.

Secondly, it means you're able to leave the server running even when your main system isn't on, which is useful if you're

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playing a game like, for example, *Minecraft*, where it might be helpful for it to be accessible to players even when you're not playing it.

Finally, it means you're able to run your own mods and maps that might not be available elsewhere, so the experience is more personalised and therefore more fun. Not a bad way to repurpose a PC at all.

“ Just because a PC isn't good enough for you, it doesn't mean it isn't good enough for anybody ”

9. Use It For Backups

None of us back up our PCs as often as we should, but if you have a dedicated system pulling backups off your main PC, then maybe you won't even have to think about it. Whether you schedule a nightly transfer of important files or manually copy the most important onto the target system, the ability to keep a second copy of your files is crucial in preventing their loss. A dedicated backup system could even be shared by multiple users in a single household.

Admittedly, you could just use an online cloud-based service like Dropbox, but this would give you the ability to configure the files, access them without a lengthy download, and back up far quicker than uploading them – not to mention the extra privacy of not transmitting your data to remote servers.

The downside is that if there's a house fire or some other catastrophe, it's not going to be a lot of help, but no backup is ever 100% foolproof. Few could survive that level of damage!

10. Sell It

Let's get mercenary here. Just because a PC isn't good enough for you, it doesn't mean it isn't good enough for anybody. If you can fix up a partial system by buying a few extra components and reinstalling Windows, you can essentially give yourself the chance to slap £50 on top of what you spend and get rid of the PC at no expense to yourself – there are always people out there willing to pay a few quid for a new system, whether they have plans for it or just want to take it apart for the components.

If that seems like too much work, you could potentially just strip it down yourself and sell the bits off individually. But by the time you've taken care of the postage and packaging, it might not be worth the amount of effort you have to spend on getting it all sent off!

Either way, don't make the mistake of thinking that because you don't want something, no one else does. There's always value in old computer hardware; you just have to make sure it gets to the right person! **mm**



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What Happens To Recycled PCs?

You may think your PC is ready for the tip, but there are other options that are preferable

Not every computer can be salvaged, and not everyone wants a salvaged computer. When a PC is no longer of any use to anyone, you have two choices: chuck it into the rubbish dump, or donate it to a recycling and reclamation service.

Recycling waste computers is by far the kindest thing you can do for a huge number of reasons, not least because the average piece of home electronics contains a large number of heavy metals and potentially lethal chemicals that, by all rights, you shouldn't be releasing back into the ecosystem without following the proper procedures.

As far back as 1998 it was estimated that Americans alone were throwing out 20 million computers a year, and that number is undoubtedly much higher now that devices such as tablets, mobile phones and laptops are released on a cyclical schedule with obsolescence built-in. So-called e-waste is regulated when it comes to businesses and large organisations, but people like us are allowed to simply throw it away.

So if your computer goes in the incinerator or gets buried as landfill, what's the actual problem? The problem, largely, is the circuitry. The average computer circuit board contains lead, arsenic, cadmium, beryllium and other elements that can be toxic to life even at low exposure levels. Similarly, flame-retardant chemicals that coat components can also damage the environment if they're allowed to decompose naturally. Some estimates say that e-waste accounts for around 5% of the waste in a landfill, but contributes almost 50% of the lead in them, and almost 70% of other heavy metals.

Admittedly, most landfills are strategically placed to minimise the risk of exposure and pollution, but that only applies in certain circumstances. When waste is shipped to poorer nations, corruption and mismanagement mean that people can and do feel the effects. For this reason, recycling PCs is both the humanitarian and the environmentally sound thing to do – but even that is fraught with potential difficulties. Some organisations and individuals claim to recycle systems, but don't, and it's hard to know where to look to make sure your hardware is taken care of properly.

Manufacturers are always a safe bet. If they offer a recycling service (you can usually find details on their website if they do) then you can be sure that they'll reclaim the components safely. If the hardware is new enough, they might even refurbish it and put it on sale.

The UK's WEEE (Waste Electrical and Electronic Equipment) regulations also specify that PC 'distributors' (meaning retailers) must provide a take-back service. This effectively means that if you replace a piece of equipment with a new one, they have to dispose of the old one for you. Some retailers will give you a few weeks to bring the hardware to their store for disposal, whereas others (like Amazon) have joined a scheme that shows you how to get your hardware to a designated collection facility. Similarly, your local council probably has a WEEE-compliant recycling drop-off somewhere nearby that you can dispose of any unwanted components and hardware that way.

But when you've dropped your hardware off with a reputable organisation, what actually happens? The reality is that it still tends to end up transported to poorer nations. The price of shipping electronic waste across the planet is more than offset by the low labour cost in places like China, India, Ghana and the Ivory Coast – not to mention a lot simpler, because of less restrictive occupational and environmental laws.

When the items arrive in these places, workers dismantle them as much as possible and then employ a variety of methods to reclaim the usable materials within. Plastic components are stripped, melted and burned away and metals are sorted so they can be reused elsewhere. Gold, lead and copper are particularly sought-after, and may be melted off the hardware or (in the case of etched pathways) freed using an acid bath.

Although these process can be performed safely, it's often the case that workers are poorly looked after and find themselves exposed to harmful chemicals and pollutants as a result of their odious tasks. Indeed, debate over the export of e-waste meant that the EU's WEEE regulations were amended to significantly reduce the amount that was ended up as landfill or junk, obliging exporters to prove that any used equipment leaving Europe was 'fit for purpose'.

The goal of the WEEE amendments was to incentivise exporters to repair and refurbish hardware. As a result of regulations like these, some manufacturers created their own programs for doing so. Dell, for example, created the largest consumer take-back program in the world, harvesting unwanted PCs, laptops and components for re-use.

Michael Murphy, who currently holds the rather extravagant title of Executive Director of Worldwide Regulatory Compliance Engineering & Environmental Affairs at Dell, said that the intent of the program was to reuse 85% of the materials that it receives – though he also noted that people were much more interested in donating computer equipment to charity than recycling it. As a result, Dell's program partnered with local non-profits to ensure that usable hardware found a home.

Dell has been running the program for almost a decade now, so it may represent the best model of what can be done with an old computer. When a PC is sent to Dell, it goes through a 'triage' process where defunct systems are stripped of usable parts with everything else sorted for disposal. Working parts are pooled to build complete systems or repair older ones. Systems that arrive already in good condition are marked for reuse, then refurbished and either put on sale at a discount or auctioned off.

Anything that Dell can't use is separated into categories and sold off to recyclers, and anything they don't want is sent to an incinerator so it can be burned to generate energy. The program's general success has saved thousands of computers – not just Dell's, since they recycle any brand – from ending up as landfill. For its part, Dell has also taken to designing its PCs for quick disassembly and low toxicity, hoping that other manufacturers will follow suit.

Of course, it's not all simple: most laptops contain brominated fire-retardant chemicals which, even when properly incinerated, can turn into dioxins. Dioxins released into the environment can accumulate in human fatty tissue and turn carcinogenic over time – but attempts to replace them are slow because there's little evidence regarding whether the alternatives might end up being worse!

The reality is that PC and e-waste recycling will never be a perfect process, but it is possible to get closer and closer to perfection. Programs like Dell's are a huge step being taken by big business, but individuals like us can still do our part by disposing of parts responsibly and with awareness. **mm**





Five Ways To Refurbish Your Own System

Give that old PC a new lease of life!

There's something wasteful about old computers. Most of us know that, under the right circumstances, our old PCs could be coaxed back into life – we just don't have the time or the means to get it back into working order. Maybe that's just an excuse, though. Maybe, with a little effort, a PC destined for the tip could be turned into something useful to someone once more.

In actual fact, it's relatively simple to turn an old, unwanted system into one that'd be useful for someone. Once it's repaired, you might be able to repurpose it yourself – as a media centre, a *Minecraft* server, or a practice Linux box perhaps? If not, you could sell it on, or donate it to someone who can't afford a new PC of their own.

In real terms, getting a system into working order again isn't that much different from upgrading. There are plenty of ways you can get it back on track. Here are just some of them.

Buy New Hardware

If you have a partial system, then refurbishing it requires you to replace the missing components so it's usable. If you're lucky, that just means buying peripherals like a mouse, keyboard and monitor, which can be done fairly cheaply. If the system requires a more extensive overhaul, you might find yourself buying things like hard drives and network cards.

The crucial thing to remember is that you don't have to spend loads to get a system back up to speed. You can pick up a cheap monitor for as little as £50, and even the cheapest hard drives are enough to run a workable system off these days. It won't cost tons and, if combined with a fresh operating system install, it'll be almost as good as new.

Don't forget the details, though. Things like backplates and screws can easily go missing from desktop systems and make it look a lot older and less well-cared-for than it necessarily is. Especially if you're planning to sell a refurbished system, a quid on things like this could add several times their price to the value to it. Don't underestimate the power of appearances!

Cannibalise Two Systems To Make One

Buying new parts is one way to get your computer back in working order, but if you have a second system available, well, why not take that to bits instead? Many components in a computer system don't really age in any meaningful way. A DVD drive is unlikely to wear out before you're finished with it, and RAM has a lifespan far longer than any home user is likely to use it for.

This means that when you're trying to rebuild a system, there are plenty of parts you can take from other systems. Peripherals are usually in short supply, but depending on what you're planning to do with a refurb you might not need them anyway.

“ If you have a second system available, well, why not take that to bits instead? ”

One thing to be careful of is that components are actually usable. It might be worth doing a stress or integrity test on things like the RAM, CPU and PSU if you're trying to repurpose them from an already-aging system, and stuff like the hard drive will definitely be of precarious durability if they've already got a few years on the clock.

Still, if your plan for a refurbished system is low-importance and low-use then there's very little reason not to get it back in working order using existing, old hardware. If nothing else, it means you have less to chuck away later on!

Wipe And Reinstall

If your system is in good working order and you're fully replacing it, then a refurbishment might be as simple as wiping the hard drive and reinstalling the necessary software. Admittedly, if fixing a PC is this easy then you might not need to replace it at all, but if that's what you're doing then at least refurbishment is a particularly easy process.

Assuming you have a legal copy of Windows that you're licensed to install, you should be able to use it to wipe the existing data off the PC and install a fresh copy of the operating system. Alternatively, if you want to install an OS, but haven't got one spare, you could download and install a copy of Linux.

If you're planning to give the system to someone else without an operating system installed, you can use the free utility DBAN (www.dban.org) to securely wipe the entire contents of a hard drive, leaving it with nothing but empty space and no possibility that your data can be retrieved. That way, whoever receives the system can choose to install their own operating system.

Whatever you install, make sure it fits your system's capabilities. Old systems may not have enough RAM to run Windows 10, for example. Ubuntu Linux is a good free choice precisely because its requirements are quite low.

Clean It Out (literally)

It might sound crazy, but cleaning out the inside of a PC can literally make it feel like new again. Nothing says 'this computer is old' like the smell of dust toasting inside the PSU when you switch it on.

Dust and debris doesn't just look and smell bad, however. It interferes with the performance of a system too. Dust insulates hardware, trapping heat and making internal air flow less effective at cooling components. It also clogs fans and heatsinks, reducing their ability to shift and disperse heat. In the worst cases, stray hair might get tangled in fans, causing them to seize up completely.

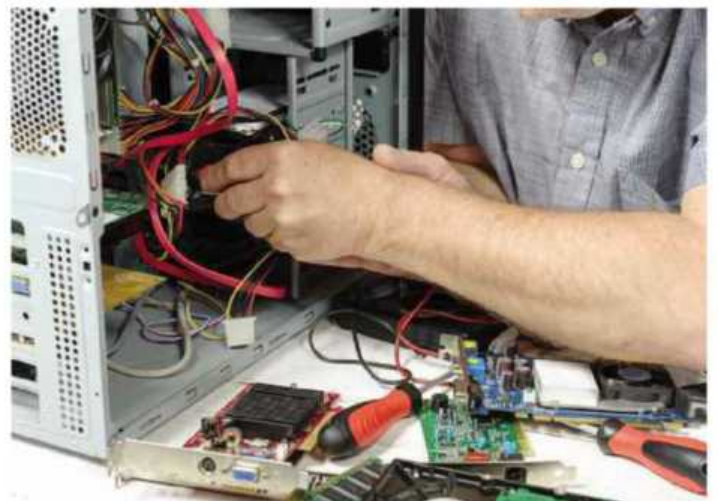
Even a PC system that's been used regularly will have a lot of dust inside, so one that's been lying fallow for any length of time is going to be caked in the stuff. Regardless of a system's age, hot components simply don't perform as well and are more prone to failure, so if you're refurbishing a computer then making sure it's completely clean is the best way to give it a better chance at survival.

The actual process is easy too: all you need is a lightly damp cloth, for wiping components, a dry cloth for making sure they aren't left wet, a small brush for cleaning out dust and a can of compressed air for blasting the hard-to-reach stuff out. Just be careful you don't zap your hardware with static!

Strip It Down

Not every PC can be saved by a bit of housekeeping. Maybe something important has broken, like the motherboard. Maybe it's just too old to be of use to anyone even after you've polished it up as best you can. We understand. In those circumstances, your best bet for extracting any value out of it – practical or financial – is just to take it to bits.

Once you've dismantled the system, you can either sell the individual components on cheaply, add them to other systems, or give them away to people as and when the need arises. You'll be surprised what folks sometimes have use for, especially if you can list parts on eBay or in *Micro Mart's* classified ads. Give them a good clean, check they're in working order and you'll be able to do something with the components – and sometimes that's a far better option than trying to bring an ailing, or plain broken, old system back to life. [mm](#)



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Mobile Antivirus

Is It Needed?

Do you really need to worry about viruses on your mobile device? We find out



There are few PC users who would think about operating their system without some form of security software, including antivirus. The prevalent and ever evolving threat of viruses and malware isn't going away, and with more personal data than ever before residing on computers and online services, the need for security is higher than ever. At least it is on PC, but does the same apply to mobile platforms?

Mobile phones are now omnipresent in today's culture. The overwhelming majority have one, and they're solidly ingrained in society. We use them for browsing the internet, keeping tabs on our daily lives, interacting with others on social media, sharing our thoughts on the likes of Twitter – oh, and we occasionally make phone calls.

With such heavy use, a lot of which requires the storage of personal data, you'd think the PC style of security would be commonplace here too, but you'd be wrong. Relatively few people consider security software to be important on their mobile devices, and a surprising number remain totally unaware of the option for such software in the first place.

“ There's no such thing as totally secure, and people will always find a way around any form of security ”

PC users will no doubt scoff at this, knowing all too well how essential this software is. However, there's often an argument about security software on mobile devices. Simply put, not everyone, even industry experts, actually believes you need such apps, and many insist mobile phones are perfectly safe.

What is the correct answer? Are security tools on mobile devices important? Is there any real threat to be feared, and should you worry about personal data loss? Let's find out.

Mobile Targets

The mobile phone, as well as other portable devices, has come on in leaps and bounds in a very short time. From simple phones with tiny LCD displays, to more flexible, larger monochrome screens, all the way to today's large, multi-touch, HD smartphones, the technology hasn't stopped. All the time, phones have been getting more and more complex and powerful, more akin to that of an actual computer. Indeed, most phones are just that, and the



▲ *Android is considered by many as the most vulnerable mobile OS*



▲ *iOS may be safer than Android in terms of viruses, but don't think it's immune*

device you carry in the palm of your hand is more powerful than most computers of only a few years ago.

In the early days of mobile phones, with proprietary and localised operating systems, limited internet access and the lack of any social media to speak of, threats of security problems such as viruses were simply not present. Phones were just that: phones. Few used them for anything other than making calls, and only the very expensive and high-end models offered internet features that were of any real use. The target for anyone wishing to come up with any viruses or other form of attack was very small, so there was little to no threat.

Of course, mobile phones didn't stay niche for long, and soon the technology exploded into one of the most successful technological markets ever. This brought with it a vast new potential avenue for nefarious coders and hackers to exploit. It also opened the door for security companies like Symantec, McAfee and others to peddle their wares. Now you can get full security suites for mobile devices that mirror those seen on PCs.

Still, even with big name solutions and other lesser-known alternatives available, a surprising portion of mobile device owners don't use them, with many not knowing whether or not they need to. This decision isn't made any easier thanks to the ongoing debate on this very topic, with industry heavyweights and critics weighing in with arguments for and against.

Insider Doubt

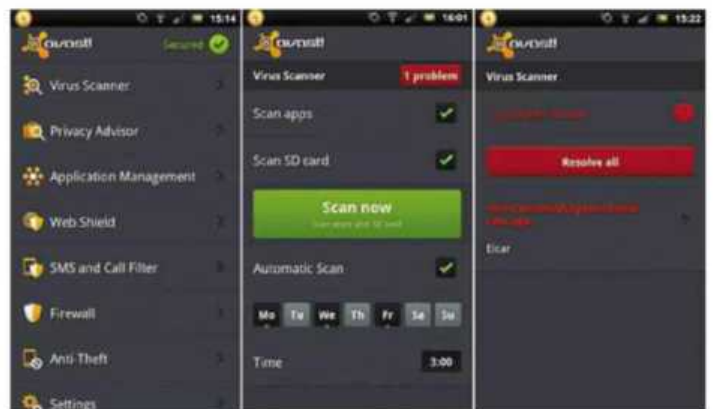
A big critic of mobile phone security apps is, surprisingly, Google. Obviously rooted in the middle of the argument, as it's one of the biggest names in mobile devices, Google staff have been very vocal about the matter in the past.

Speaking at Google I/O in 2014, Adrian Ludwig, the lead engineer for Android security, said, "I don't think 99% plus users even get a benefit [from AV]." He continued, "There's certainly no reason that they need to install something in addition to [the security Google provides]."

Backups

A common feature security apps bring to the table is the ability to back up data. As it is in the PC market, this is something that many people overlook or simply ignore. This can lead to all sorts of problems, and you can easily lose important information if your device is damaged, lost or stolen.

Many backup tools do so using a cloud structure, meaning your data is backed up online. This allows users to retrieve information even without the source device. It's an obvious benefit, and even if you don't plan to use the malware or virus protection side of an app, backing up still makes it worthwhile.



▲ *Avast is one of many commercial antivirus apps on mobile devices*



▲ The PC favourite Bitdefender is available on mobile devices

Google's Open Source Programs Manager also commented on this in 2011 and was much more critical. He said, "Yes, virus companies are playing on your fears to try to sell you bs protection software for Android, RIM and iOS. They are charlatans and scammers. If you work for a company selling virus protection for Android, RIM or iOS, you should be ashamed of yourself [sic]."

Those are stern words, and it's obviously been some time since the quote, but it's a comment that helps to illustrate a point and show an option that's shared by a good deal of potential customers. Simply put, there's a belief that security software just isn't needed and that security companies are using the increasingly public security attacks we see in the news to scare users into buying expensive security solutions when they don't need them.

Of course, security companies are going to do this and use high-profile attacks as advertising hooks. It's true, this certainly appears to be scaremongering, but this isn't usually the case. Weight Watchers, for example, uses the threat of health problems to promote its weight loss products in much the same way, and although obviously used to highlight and sell the product, few would argue a poor diet is bad for you.

This exploitation of a need is a natural method of selling and uses leverage like this to highlight this need even more. It emphasises the reason a customer should be interested and how by not buying the product, they'd be worse off. It's not dastardly or conniving; it's just good business sense. The fault here isn't necessarily the security vendors; it's the general lack of understanding on the buyer's end.

Such ill-chosen comments from the likes of Google, which some would argue is the biggest name in the field these days,

Dodgysoft

It should go without saying that illegal, pirated software, including cracked or jailbroken apps can be common vectors for viruses and malware. Downloading and using such software always represents a risk, not only due to the shady nature of the software and the sites it comes from, but also thanks to the lack of any official support. After all, you're not going to be able to call up Apple if your iPhone is crippled by an unofficial or illegally copied app, are you?

To stay safe, steer clear of such software, and although the temptation to crack or jailbreak your device to open it up and make it more flexible may be strong, try to resist if you're overly concerned about security and the potential risks.



▲ Symantec's Norton can be found in mobile form



▲ Google Play is packed with apps, but not all are safe

don't do people any good, and although Google wouldn't want to admit there are any security holes, we all know that even the most secure system is far from bulletproof. People need to know the limits of their device's security and the potential risks.

Sure, Android devices are nowhere near as high profile in terms of attack as PCs, but they're by no means ignored. In fact, reports of problems have been increasing for a while now. Google devices are especially vulnerable to attack due to the open nature of the Android OS.

Programs developed for the platform utilise Java, and this is easily available to anyone and easy enough to learn. Virus and malware coders need no special hardware or equipment to concoct attacks for distribution on Android devices, unlike iOS, which would require a Mac and other tools. For this reason, iOS and Apple devices, while not immune by any means, are considered to be safer.

Secure Enough?

With some experts claiming security software is not needed, does this mean you're safe and shouldn't worry about outfitting your phone or tablet with some form of protection? No, absolutely not. The simple fact that has been and always will be present is there's no such thing as totally secure, and people will always find a way around any form of security. This is why security companies can never rest.

Mobile devices may be harder to attack than standard systems, but attacked they are on a regular basis. These attacks are not often in the same manner as the PC, and compared to the home computer, mobile device viruses are relatively rare. More often than not, security risks are unknowingly welcomed onto the device by the user.

Malware infections are usually picked up via downloaded apps, and once the program is installed onto the device, the malware can do its job. Much of the time, these apps are created and deployed to steal user information, for financial gain, self-replication via address books or both. As with the PC, this malware can come in various guises, with none being welcome. Unless you know it's there, which is much more

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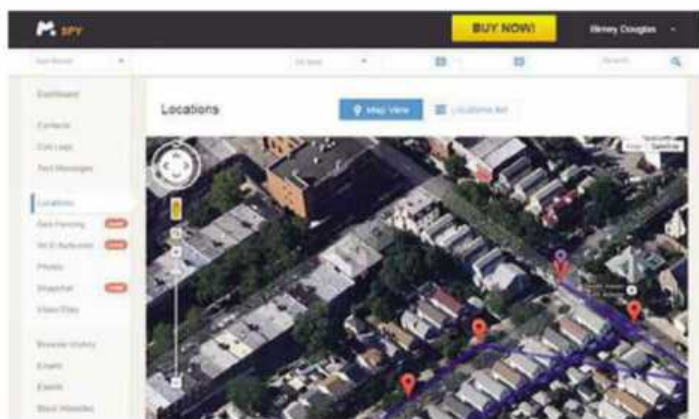
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▲ Mspy is an effective mobile device tracker

difficult to notice on a mobile device, it can sit comfortably performing its task.

Therefore, it's important to be careful and to know what you're downloading. The general rule here is to avoid, if at all possible, web-based downloads. That is, downloading apps from the web directly via a mobile browser. Instead, stick to your device's native app store. Although not infallible, this is by far the best way to avoid trouble and it's the route that's more easily covered by your phone's built-in security.

Google's Play store is arguably the most at risk of all the stores, as app development is far more open on Android, and the Play store is less controlled than competitors like Apple's App Store. This means it's easy to approach for developers, but there's also a greater chance of malware being present, albeit still rare.

Because of this, it's certainly not a bad idea to load up some form of malware protection, if only for peace of mind. If you're concerned about paying too much for the software, though, don't fear. As with the PC, you can get free protection, and some of it is very good. With this, there are really no worries aside from the use of some storage space and CPU resources – a small price to pay for added security, many would argue.

A good example is 360 Security. Found on the Android store, this is a decent antivirus and malware app that can scan your device for any problems, and it has a real-time monitor for constant protection. It's popular with Android users and is updated often, as all good security apps should be.

More recognisable names are also found on Android, such as Avast, a stalwart of PC security. It's one of the more feature-packed tools for mobile devices and comes in free and subscribed forms.

Likewise, AVG has a presence, as does Bitdefender, both of which are also very respectable tools in their fields. No anti-malware list would be complete without one of the most popular such tools, and mobile devices also have access to Malwarebytes, which is also free and, just like its PC counterpart, is recommended.

Of course, the big names of the industry are also present, such as McAfee, Symantec and Kaspersky, and they come with free tools, trials and subscriptions, with the former obviously being feature-limited to bait that subscription hook.

The Biggest Threat

One argument against the more standard form of security we do totally agree with is the belief that typical malware and virus attacks aren't the most dangerous and prevalent security risk for mobile users. The single biggest risk is still theft and loss. This is the most common problem faced by mobile device owners and the one that can spell the most trouble. Just ask anyone who's



▲ Flexispy will let you track down your phone if it's lost or stolen

lost their phone how panicked and insecure they felt after such a loss. With so much personal data and private details on the device, it can be one of the scariest things to happen to anyone, and fearing that a stranger has access to all of this is nightmarish.

Of course, no malware or antivirus app can help here. If your phone is stolen, it's stolen. If you lose it, it's lost, so it's important to take some security measures pre-emptively. This includes the use of mobile device tracking software. There are plenty of these tools around, and they can be installed onto a phone and paired with some PC software. The PC-side of the app can then be used to actually track down a phone, as long as it's powered up and the battery is in place. It can help locate a lost phone or even track down a thief. We'd consider such apps to be essential.

There are many on the market, including popular tools like Spyera, Mspy and FlexiSpy, as well as many free alternatives. The thing to look for here is an app that runs silently, with no trace, otherwise a thief could easily notice and deactivate it. Such apps also need to run as a service with the phone and not need a manual start. This is a staple for most apps of this type, but it's best to make sure it works well with your model of phone and OS version. We'd also recommend an app that integrates with easy-to-use GPS systems like Google Maps, as this makes it much easier to use on any device, anywhere.

It's not just loss and theft that present a risk, however, and if you plan to sell or give away an old device, you need to be careful what you leave on it. Our mobile devices store so much private information, it's just plain crazy to omit this consideration. This alone is one big reason to install a security app, as many also come with secure data shredders and contact management tools. These are certainly recommended, and we'd strongly suggest you use such tools before you part with a device. [mm](#)

Call In The Clones

One of the most problematic threats mobile device users face are clone apps. As you may easily guess, these are illegitimate, sometimes malware-infected apps that masquerade as an official version. Like phishing and scam emails, they attempt to fool people into installing them, thinking they're the real thing. Any data entered into these apps can then be gathered easily, and if this app deals with sensitive info, such as bank details, the threat is very clear.

To avoid these problems, always check the app you're downloading comes from a reputable source, read up on feedback and, if in doubt, contact your device's support or that of the official app developer.

Alphabet Pi:

David Briddock meanders through Raspberry Pi technology from A to Z

S

THIS WEEK: Scratch, SD Cards and Swag Store

Scratch

The Scratch programming language, created by MIT's Media Lab (media.mit.edu) is pre-installed on the Raspbian distribution image.

With Scratch you code using a collection of graphical snap-together programming blocks, rather than using a traditional editor and symbolic language. The interactive code/run process takes place in an interactive workbench app, where you can also create graphical images, known as sprites. With Scratch anyone can create animation and multimedia apps.

The block-based approach transforms the classic coding process into a visually attractive, fully immersive experience. Scratch is especially popular with teachers and younger students. In fact, the colourful visual interface encourages anyone old enough to use a keyboard and mouse to have a go. To see what's possible in Scratch and download source code examples visit the scratch.mit.edu website.

SD Cards

The Raspberry Pi board doesn't come with any onboard storage. Instead you'll need to purchase an SD memory card. It's this memory card that holds the Pi's operating system and your personal files.

“ With Scratch you code using a collection of graphical snap-together programming blocks ”

While this may seem a little unusual at first it's a very flexible solution. It means you can have a number of SD cards, each with a different operating system. For example, a Raspbian SD card for Pi experimentation and coding plus an OpenELEC one to transform your Pi into an entertainment media hub.

Each operating system takes up quite a bit of memory space, but you also need to ensure you have plenty of free space for apps and your personal files, code and data. The latest Raspbian Jessie distribution image is already over 4GB, so in this case you'll need an 8GB SD memory card.

Unfortunately, not every SD card on the market is compatible with the Raspberry Pi. So it's a good idea to check out compatible brands before you buy. The eLinux website provides a very comprehensive list (goo.gl/RTFRL).



▲ Scratch Desktop

If you still need more storage space the Pi's USB ports mean it's easy to add more by plugging in a USB memory stick or a USB connected hard drive.

Swag Store

The Raspberry Pi Foundation launched the Swag Store (swag.raspberrypi.org) as the official Raspberry Pi store for Foundation approved products. It stocks many of the items you'll need to begin your Pi adventure, this includes a collection of books and other learning resources, plus a range of Pi-branded goodies to help jazz-up your work desk. It's also the new home of the *MagPi* magazine since the Foundation took over its management. What's great about the whole initiative is that, when you buy from the Swag Store, you'll know any profits are going straight to the Raspberry Pi Foundation for future hardware, products, open source software projects and educational initiatives.

However, if you'd like to browse a much wider choice of Pi accessories head over to one of the major Raspberry Pi suppliers: Pimoroni (shop.pimoroni.com), The PiHut (thepihut.com), ModMyPi (modmypi.com), RS Components (uk.rs-online.com), Farnell (uk.farnell) and Adafruit (adafruit.com).

Before the Swag Store materialised, the Raspberry Pi Foundation also setup the Pi Store. The idea was to make it easier for anyone to share their apps, tools, games, code and tutorials with the rest of the community. Today it's been replaced by the main Raspberry Pi site (raspberrypi.org) and the Swag store. [mm](#)



How To Get Your First IT Support Job

David Hayward looks at some key points for how to get started in the industry



▲ Working in IT is hard at times, but very rewarding

My first IT job was as a helpdesk technician at a university. I managed to get an interview based on the fact that I was a keen enthusiast and I had some experience, albeit at home, of building a PC from scratch. At the interview, I was required to build a PC from an assortment of components laid out on a table, which I did. After that was a chat with the IT manager, and I was offered the job on the spot.

It was generally a fun job to have; there were times when the workload was utterly tremendous, and I bore the brunt of everyone's IT ire and frustrations. And there were times where things were pretty relaxed.

Times have changed significantly, though, and where getting into an IT role based on some loose homegrown skills was once the norm, these days the potential recruit has to hone their skills, qualifications and experience to a fine degree. I for one certainly don't envy those starting off.

Getting Into IT

Enough about me, though. How would someone today get a foot in the door for their first IT job? What qualifications are worth looking at? Do you need any prior experience in a business environment? Where do you start looking? What sort of pay can you expect? Do you go permanent or contract?

Education

Starting off in IT doesn't necessarily require you to have a degree in a computing subject. It'll certainly help, as will having other industry qualifications, but as the National Careers Service states, "If you have a good working knowledge of computer systems,

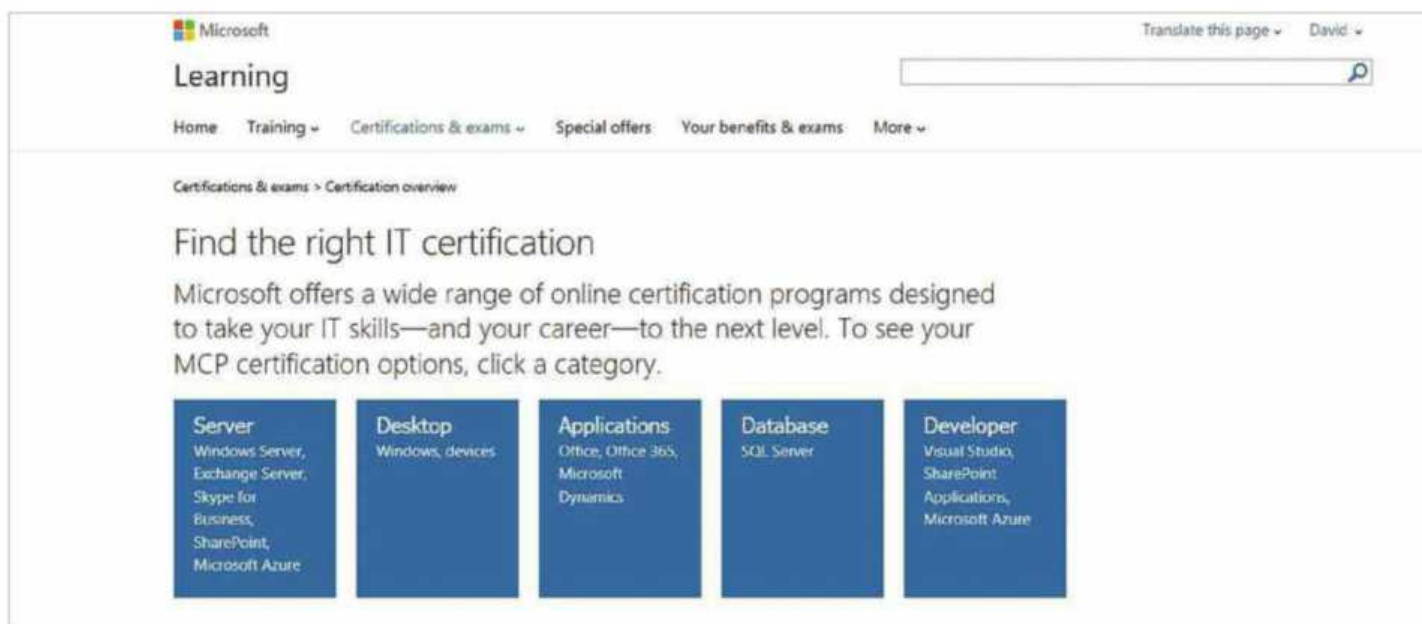
“ These days the potential recruit has to hone their skills, qualifications and experience to a fine degree ”

you could be taken on by a company as a trainee technician and receive on the job training.”

Obviously you'll be a more attractive candidate if you have good GCSE results – mostly Cs and above in maths, English and of course, IT/computing. Furthermore, if you can enhance those base qualifications with a relevant college qualification, such as an

The screenshot shows the UKCISCO.com website. At the top, there's a navigation bar with 'Log In', 'Home', and 'Getting in Touch'. A prominent banner features a man looking at a document with the text 'Busy with work? Learn in your own time at your own pace with our online classrooms and labs'. To the right of the banner, there's a 'Request a Callback' button with the number '0800 622 69 69'. Below the banner, there are several promotional boxes: 'Free CCNA Trial Start the CCNA with support' with a play button icon, 'Find an Exam Center', and 'Cisco Job Search'. At the bottom, there's a row of certification logos: CCIE, CCNP, CCNA, Cisco Certified Network Associate, CCDA, CCENT, and Cisco Courses.

▲ Cisco's range of qualifications are considered some of the best in the world



▲ Microsoft qualifications can take you a long way in IT

A-level or a BTEC Level Two or Three in an appropriate subject – such as Information Technology BTEC Extended Diploma/Diploma – then you stand a better chance of securing an interview.

Other qualifications worth thinking about, that are a little more focused, can be difficult to come by since they often cost a significant amount (up to £1,000 or even more) and aren't always taught at a local college or other such training facility.

One of the most popular of the IT qualifications available is the Cisco Network Associate, which is broken down into four different courses: CCNA Routing and Switching, CCNA Security, CCNA Voice, and CCNA Wireless. The main course is Routing and Switching, which is ideal for those looking for entry-level network

“ Starting off in IT doesn't necessarily require you to have a degree in a computing subject ”

engineering jobs. The other courses all require the Routing and Switching as a prerequisite, but they tend to focus the qualification into the respective fields and develop the candidate to be able to aim for something more specific when they come to apply for a position.

The popular Microsoft qualifications still hold a fair amount of sway in the industry too. The MTA Microsoft Technology Associate, MCSA Microsoft Certified Solutions Associate and MCSE Microsoft Certified Solutions Expert are all globally recognised and considered essential by some companies for desktop support, first- and second-line technicians.

As with the CCNA qualifications, the Microsoft set can cost a fair amount. Prices vary drastically from one training company to the next, but you could be looking at anything from £900 to £1,500 for one module (each qualification is made up of several modules). It's a little confusing as to what you may or may not

need, as you could happily get an IT job with a single module as opposed to the entire qualification. For more information, take a look at the Microsoft Learning page at goo.gl/eHwKao.

There are also qualifications available for those who want to work with Linux systems. The Linux Foundation offers both Linux System Admin and Linux Engineer qualifications, which again cost from £500 onward. And CompTIA offers a range of Linux qualifications, starting with Linux+ and moving onto server-room-based qualifications.

Most of the above are worth looking into, depending on what level of the IT industry and what type of job you're interested in doing. However, don't become too focused on obtaining that MCSE or such. If you're looking to start at the ground floor in IT, then it's not really cost effective for you as an individual to spend thousands of pounds on a course to begin with. If there are some available for a couple of hundred, though, and you can easily afford it, it could be worth the investment to have an edge over the competition.

A lot of the above mentioned qualifications are something that can be gained once you have the job and, what's more, the company is often willing to pay the costs, provided it knows it's investing in the future of one of its workers.

Skills

Relevant skills can often trump qualifications depending on the role applied for and the applicant themselves.

One candidate having a degree in IT and very little motivation when they come face to face with the interviews will be less likely to succeed than someone with few qualifications, tons of experience and brighter aspect.

Skills aren't always easy to convey on a CV, though, but thanks to the modern internet, it's extremely easy to build yourself a portfolio of skills.

Consider starting a blog based on your IT skills. You can have

► *Linux is becoming more vital in many first-line IT roles*



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Job profiles

IT support technician

If you are interested in computers and like solving problems, this could be the perfect job for you. IT support technicians help to find and correct software and hardware problems for computer users.

To become an IT support technician, you will need to have a wide knowledge of operating systems. You'll also need to know about networking, hardware and software. And you'll be able to explain problems and solutions clearly to non-technical users.

If you have a good working knowledge of computer systems, you could begin as a trainee technician. You may improve your career prospects by gaining IT qualifications.

Hours	37-40 per week
Starting salary	£18,000 + per year

▲ *The role of IT Support is always expanding and pushing the boundaries*

a picture-by-picture entry detailing the building of a top-notch gaming rig, or a post about how to build a basic home network and the various problems you may come across. It doesn't matter if you're building a media centre PC or a gaming desktop; it's the fact that you're advertising your skills and knowledge in desktop support.

It's also worth setting up a YouTube channel where you can review components, build PCs and show how to diagnose faults on a network and so on. With some good editing, an effective showcase of your skills can be achieved with relative ease, and when you add the link to your CV, the company will not only see a demonstration of your skill, they'll also be able to review you as a person and how you come across to others.

The blog or YouTube video could be something you build up while at school or college, and there's always the chance that someone may comment with an alternative and effective method of installing Windows or a hard drive or something. One way or another, it's a learning experience for you and something you can proudly display prior to and in an interview.

Experience

Experience in IT is, like the skills section, something that can often trump qualifications. A lot of companies will often take on someone with experience of being in a helpdesk environment rather than someone who's just finished their qualification.

It's not always easy to find and build experience, though, and by experience I mean recognised experience in the industry. To begin with, you may be best looking for volunteer opportunities, to build up a CV of companies you've worked with and who can provide you with a reference.

Although it's not always an option, you could ask if a company is willing to take you on free of charge just so you can gain valuable experience within a team and doing the job. Be aware, though, that just because you're offering to do something without being paid, a company can't always take someone on, as it needs to cover the costs of health and safety, security and so on.

It's tricky, I'll admit, but it's not impossible. Even if you just help out at school or college, setting up a room ready for a lesson or setting up a new computer suite, it's an experience worth mentioning.

What The Employers Have To Say

We asked a few managers and other employers what they'd like to see from a potential candidate. Most replied, but with the understanding that their names and the companies they work for be anonymous.

John, IT Manager At A City-Based Research Lab

MM: What qualifications would you look for in someone new to the IT industry (such as a junior technician, technical support or helpdesk role)?

John: Mainly good GCSEs, BTEC Level Two, degree if possible. Industry qualifications are great but not essential.

MM: What sort of experience would you look for in someone new to the IT industry?

John: As much as possible, really. Any home built systems they've done, projects completed, testimonials from users they've helped. Any volunteer work within IT and use of varied hardware and software will earn them much respect.

MM: What's the learner journey for most successful applicants coming into your organisation? Are they from college, university or from work experience?

John: Most younger recruits come from college, either post A-level or BTEC or in the last year and still working towards. Older recruits tend to come from other industries, such as electronics or telephony.

MM: What are your top two essentials and desirables when interviewing a candidate?

John: For us, we look for a team player and someone with the desire to learn. Desirables can change from one job to the next, but mostly it's a base industry qualification or working toward one.

MM: Is there one qualification, skill, attribute, quality that would make a candidate stand out from the rest?

John: Team player, good communications skills, patience and a willing to learn – more than one, but imagine all them combined.

MM: What key factor would make you want to interview someone for a job in IT support?

John: A well planned CV and cover letter – not too long and not too short. Make sure you've hit the sweet points in the job description.

MM: What would your advice be to someone who is looking to get into an IT support role?

John: Prepare to take on a lot of work to get started and noticed. Be flexible in your work, enthusiastic and willing to improve.

109 jobs for helpdesk in east anglia

Helpdesk Analyst - Hampshire - £24,000
 Fareham - £20k - £24k per annum + benefits
 Permanent
 Posted: Tuesday, 14 June 2016 Viewed: 1 hour ago

Applicants must be eligible to work in the specified location

Helpdesk Analyst/1st line Network Support - Fareham, Hampshire - up to £24,000 plus benefits.

The Ashdown Group have been engaged by a successful global IT business, seeking to recruit additional IT Support professional to join their fast growing team.

You will be a strong communicator and understand the importance of good customer service. Working from a busy helpdesk, you will work to achievable targets, aiming to resolve 60-70% of issues at 1st line and within 30 minutes, escalating on any issues that can not be resolved within that time frame.

As the business offers support globally to its customers, shifts are worked on a 24 hour rota (not weekends). 3 weeks of every month, you work 09.00am - 5pm, but the 4th week of each month will be either an evening (16.30 - 01.00) or night(00.30 - 09.00) shift. For those late shifts an additional payment of 25% and 40% of your salary, respectively. This means you earn around £24,000, including shift allowances, with the option to swap shifts with your colleagues to increase your salary further if you wish.

The successful candidate should have demonstrable experience working on an IT helpdesk or in an IT support environment at 1st/2nd line level and of providing good customer service. They will demonstrate good knowledge of Internet technologies and of networking infrastructure such as TCP/IP. Experience with Linux, VPN, proxies, web filtering as well as Active Directory would also be very advantageous.

In return, the successful candidate joins a friendly team environment, where they will receive training and develop their networking knowledge, including TCP/IP, routing, DNS, VPN, Firewalls, Proxy, web filtering, Active Directory and Linux and have the opportunity to progress in the business to 2nd and 3rd line teams, in due course.

The salary on offer is up to £20,000 plus typically an additional £4000 in shift allowance. (The initial 3 month probation period would be paid at £17,500, rising to £20,000 after that). As part of their benefits package there is a pension, free parking and 22 days holiday. If you think you demonstrate the necessary qualities, please send a Word copy of your CV with the reference number ASH14710RT in the subject line.

The Ashdown Group Ltd acts as an employment agency in respect of permanent vacancies and as an employment business in respect of temporary vacancies.

Location Fareham, UK

▲ A quick look on Jobserve for helpdesk roles in East Anglia

If you're lacking server or experience of a particular desktop OS, there's always a chance that the software can be obtained for a limited trial period for free. Microsoft Server 2016 Technical Preview 5 is available with a 30-day trial, provided you register with MS. You can then run it either in a virtual environment or on a physical machine for the time period. Either way, you'll gain some experience of its use and how to deploy it.

Responsibilities, Essentials And Desirables

Most jobs advertised are broken down into sections: the responsibilities of the candidate, the essential skills and qualifications and any extra desirable elements.

You as a candidate need to break these down into what you can offer, but without becoming disheartened because you don't have one or two of the stated elements.

For example, an IT support role may ask for a degree in IT or relevant subject. However, just because you don't have a degree doesn't mean you're out of the running. Use the other areas to boost your abilities and experiences, mention that YouTube channel or blog, list your experiences in a similar role as a volunteer and mention the qualifications you're working towards.

A candidate who is professional, efficient and with a high degree of customer service skills will attract as much attention as the one with a higher-end qualification. It's not a sure-fire thing, of course, but you need to fight your corner.

One of the IT managers we spoke to recommended making a list of the advertised duties and responsibilities of the job in question and drilling them down to their finest points. If a role says you need to be able "To work effectively and productively with third-line support", then break down all the times you've stayed an extra half hour to help run some cables around a building or that time you helped the server administrator fit a

rack-mounted UPS. You may have only supported the weight of the UPS for the server admin, but you worked with third-line support, and you were willing to help out when necessary. Obviously don't lie or embellish the truth too much; just be aware that little instances of support may make the difference.

The CV

The CV is often the first impression a candidate makes on a company, therefore it's a pretty important element in the whole job hunting experience.

I'm not going to tell you how to write your CV, because I'm by no means qualified for such a task, but having seen a number of CVs during my time, I can give a few tips to help make yours stand out.

Frame Your Achievements

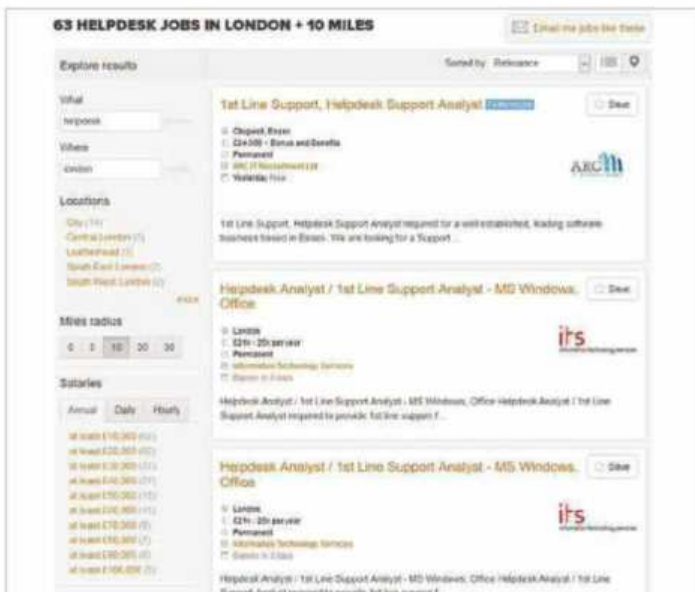
Don't just list all the places you've worked for in the past; that's not enough. Consider adding a few lines detailing (in brief) what added value you gave to those companies.

For example, what deadlines did you deliver on, what projects did you help to complete on time, what improvements did you make to the company and what recognition have you had (e.g. employee of the month).

Technical Skills

We've already covered this to some degree, but to emphasise the point, you're going to have to list what IT skills you possess depending on the job you're applying for. As one recruitment advisor told me, "Don't be afraid to tailor your CV for the job. Don't lie! Just push those skills that are desirable to the top."

List any personal work you've achieved (e.g. fixing your neighbour's PC). What OSs can you install and maintain? What projects have you worked on from the pages of Micro Mart that



▲ London-based helpdesk roles tend to come up all the time

have been successful, and have you improved on them? Mention that blog or YouTube channel too.

Have You Got What It Takes?

Leading on from the technical skills, read the job description carefully. If you're applying for a first-level helpdesk role, then perhaps the ability to recompile a Linux kernel is irrelevant compared to the fact that you have excellent people skills and the ability to talk someone through a problem over the phone.

Also, if you're applying for a junior developer post, don't forget to provide links to code you've produced or demos of your work online.

The Cover Letter

The cover letter is as important as the CV. It's the first thing that a prospective employer reads, so make it snappy and persuasive enough to warrant a look at your CV.

“ Relevant skills can often trump qualifications, depending on the role applied for and the applicant themselves ”

Use words and phrases from the job description to highlight those areas that make you right for the role. Refer to the CV as soon as possible in the opening sentence, then maybe once again towards the end.

Draw on what transferable skills you have from your previous jobs that can be used in this job, even if the sector is totally different. Dealing with an awkward customer is universal.

And finally, include your availability for an interview and a start date. If you're out of work, then this could be as soon as possible or as soon as the company wants the post to start. Remember if you're out of work, then you have an advantage over someone who may need to give three months' notice. There are loads of tips, tricks and advice out there on writing

Mary, Agency Recruitment Advisor

MM: What qualifications would you look for in someone new to the IT industry (such as a junior technician, technical support or helpdesk role)?

Mary: It depends on the job. Most of the time, qualifications at L1 aren't as important as a willingness to learn and work hard. A-Levels, though, are a bare minimum in most cases, as are Microsoft qualifications.

MM: What sort of experience would you look for in someone new to the IT industry?

Mary: Good technical knowledge, both of software and hardware. Great customer service experience, even if it's serving behind a bar.

MM: What's the learner journey for most successful applicants coming into your organisation? Are they from college, university or from work experience?

Mary: A bit of everything. We see a lot of ex-military personnel and ex-BT engineers. Younger people come mainly from college or university.

MM: What are your top two essentials and desirables when interviewing a candidate?

Mary: Good customer care, proven team player. Software skills beyond operating systems, such as VMWare, web servers; also hardware like switches and routers.

MM: Is there one qualification, skill, attribute, quality that would make a candidate stand out from the rest?

Mary: Again, customer care. It's paramount to L1 support roles.

MM: What key factor would make you want to interview someone for a job in IT support?

Mary: A good mix of skills and experience, a neat and informative CV. Good telephone manner.

MM: What would your advice be to someone who is looking to get into an IT support role?

Mary: Don't give up! Keep applying and refreshing your skills.

the ultimate CV and cover letter. Your best bet is to read the advice from job search engines, because they see thousands of applications a week.

Contract Or Permanent?

If you have a house to run and a family to look after, then a permanent post will probably be all you're looking for, but have you considered contracting?

In this current climate the amount of short term contract positions has increased dramatically. Whereas a few years ago



▲ *helpdesk or first-line support roles, pay has increased dramatically over the years*

you could have landed a 12 month contract, nowadays you could be looking at anything from one week to 2 to 3 months. Don't let this dishearten you, though, as a contract could be a valuable stepping stone into a permanent role.

Completing a short-term contract will not only give you much needed experience in the IT industry and some cash in your hands, but a lot of companies who often look for contractors tend to stick with the ones that they know will do a good job. If you manage to get yourself onto the books of an agency and land a contract, then try your best to go above and beyond the call of duty. Get stuck in with the work and offer any extra hours. Contribute as much as possible without becoming too annoying, and you may find yourself with an extension on the contract or, with luck, led into the board room for a discussion to make your role permanent.

It does happen, and it's all down to the amount of effort you put in. Finding the right contract will depend on how much experience or qualifications you have already, if you're totally new to the IT industry, but if you have home experience of installing Windows and such, then look for something along the lines of desktop roll-out contracts. They tend to only last a week or so and involve ghosting and delivering desktops across the company.

Once you have a few of these under your belt, you can aim for helpdesk work, which usually lasts a few months at best. After that, you can begin to specialise in desktop support, network administration or software support.

Another good bonus to contracting, and one that I've used in the past, is if the company you're doing the contract for turns out to be terrible, you know you'll be gone in X amount of weeks and you won't have to deal with them any more.

Pay

Pay is a tricky element to nail down. One company may offer £18k for a helpdesk or support role, whereas another may offer only £15k. One end of the country will start the role at £16k but the same role in a city may go for as high as £28k.

The CWJobs Salary Checker, for example, states that a helpdesk support job's average salary is around £27k, whereas



▲ *The average differs considerably, but it's not a bad wage*

Payscale.com's median salary for the same role is £18,709. A helpdesk analyst in Hampshire is advertised for £20k to £24k, and the same role in Hull goes for £18k to £21k.

Of course, not all helpdesk or support roles are equal, and one company may demand a special set of skills over another and will offer more in return. The number of years of experience can also effect the salary, as can, sadly, whether you're male or female. The average salary graphs from Monster are worth looking at, if just purely out of interest: goo.gl/HTk6kk.

Based on what I checked through Jobserve.co.uk and taking into account London, Midlands, East Anglia, the North, Scotland, Wales and Northern Ireland, the averages work out (very roughly) as:

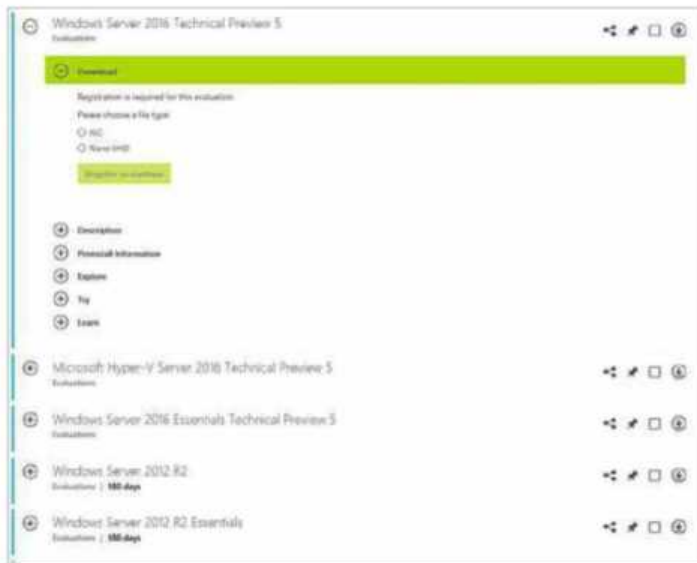
- Web based – £47.5k
- Security – £52k
- First-line support (inc. Helpdesk) – £19k
- Second-line support – £26k
- Third-line support – £35-45k
- Project manager – £57.5k
- Developer – £47k
- Network engineer – £40k

Depending on where you're located, these numbers will differ, and they're certainly not written in stone. But you can see where various factors affect a salary, the more you look into each role.

The Job Sites

Picking up the Thursday job section in the local newspaper isn't enough to find a job these days; you have to cast your net a little further.

Since the rise of the internet, companies and recruitment agencies have used the medium to advertise their vacancies. In today's climate, it's the agencies that do most of the recruiting on behalf of the companies, since it generally costs less for the companies to filter through the applicants, and the agency can offer a more technical eye over a CV than the HR department of a company.



▲ You can gain experience in the latest server/OS technology through free trials

There are a number of good job sites that feature the adverts posted by the agencies, and most repeat the adverts, but you can often find a job advertised with one that's not with another. A couple worth looking at are:

Jobserve

Jobserve has been around for years; it's like the daddy of job search engines and, what's more, it's really easy to use.

Located at www.jobserve.com, there are countless vacancies available. Just select the industry from the list (IT & Telecoms in this case), type in a keyword such as 'helpdesk', and enter your location.

You can then filter the number of days to search from and whether you want a permanent or contract job.

Once you click 'Search', you'll see the results based on the number of miles from the location you entered and the age of the advertised job. Don't forget to spread the location around a bit, as a listing is often advertised depending on the wording the agency used when putting the job up.

As well as searching for Lowestoft, for example, search for Norfolk, since it's on the Suffolk/Norfolk border. Although only 20 miles separate Norwich from Lowestoft, there are dozens of jobs you could miss out for the sake of a 40-minute train ride.

Obviously, you'll know your area better than me, but it's worth thinking anywhere up to a 50 mile radius from your home town – or a cost effective commutable distance, at least.

CWjobs

CWjobs is another old-school search engine that's always come up trumps when searching for location-specific jobs.

Go to www.cwjobs.co.uk and as before, type in your search parameters. I've often found that CWjobs displays jobs that aren't on Jobserve, or if they are, they can be from a different recruitment agency and may give a little more detail. Plus CWjobs includes any postings from a direct employer, which is another area that's often left out when searching in Jobserve.

Good Luck

Hopefully you have a number of interviews lined up for the permanent posts you've applied for; the contract posts can often be accomplished over the phone or by visiting the agency that's handling them.

Bruce, Helpdesk Manager In A University

MM: What qualifications would you look for in someone new to the IT industry (such as a junior technician, technical support or helpdesk role)?

Bruce: Good GCSEs, A-Levels, BTEC, ECDL.

MM: What sort of experience would you look for in someone new to the IT industry?

Bruce: Someone with proven customer service skills. Able to deal with an issue and take responsibility of it. Someone with proven analytical skills – IT not important.

MM: What's the learner journey for most successful applicants coming into your organisation? Are they from college, university or from work experience?

Bruce: It's a mix, really. I see a lot of uni grads these days, where it was once college leavers. Quite a lot now come from work experience and other industries.

MM: What are your top two essentials and desirables when interviewing a candidate?

Bruce: Hardware and software knowledge, customer service skills. Microsoft qualification or working on one, willing to build on skills and take on other responsibilities.

MM: Is there one qualification, skill, attribute, quality that would make a candidate stand out from the rest?

Bruce: A strong personality. That means someone who is willing to get stuck in, can tackle a problem or an overbearing user, can manage their time and workload and who is able to learn from their peers.

MM: What key factor would make you want to interview someone for a job in IT support?

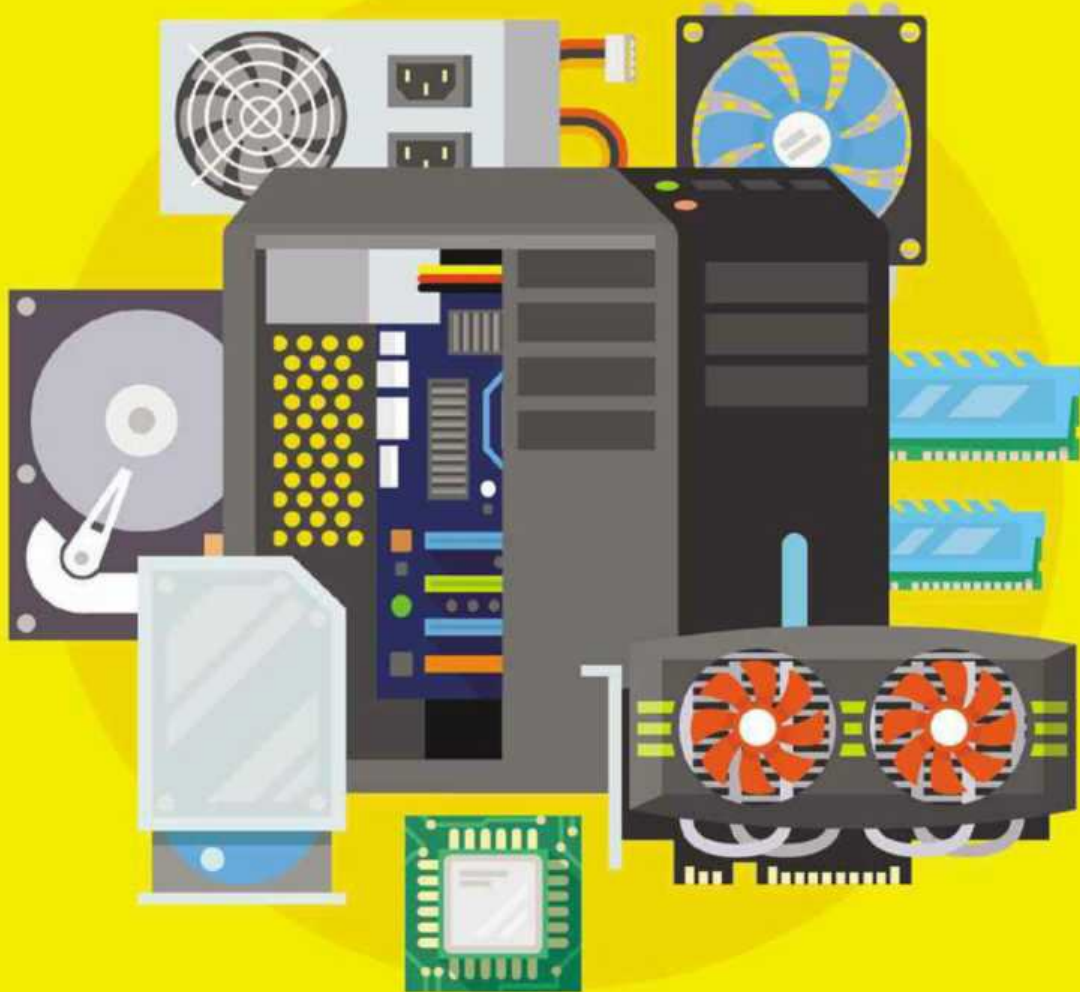
Bruce: Good question. An easy-to-read CV and cover letter. Someone who ticks the right boxes for the job description and goes to the effort of showing they do.

MM: What would your advice be to someone who is looking to get into an IT support role?

Bruce: Expect to work hard. The entry-level helpdesk isn't a place for the faint-hearted, but with hard work you'll succeed and move onto second line support and beyond.

I can't comment on interview skills because I'm a nervous wreck during them, on both sides of the table. But try to keep calm, and remember to mention your IT achievements, goals, aspirations and where you want to be in five years' time. Don't forget to add that extra help you give your friends and family or even the advice you give on forums, your YouTube channel, blog and so on. Every little detail will help you get that job.

And finally, good luck. **mm**



Game Changing Components

Mark Pickavance looks at the bits of the PC that have entirely altered what we expect from computers and what we can do with them



The PC is a curious amalgam of things that were fully intended and others that just evolved. Over its history, we've seen many changes of direction, some that brought us here and others that went down technological dead ends.

Here is my very personal collection of those bits that, once they appeared in PCs, altered the future direction of computing.

AMD Opteron

If you track the launch of Intel processors from the IBM PC 8080 to modern day, you'll notice that in the early days, new processors came along at glacial speed. It took them three years to go from the 80286 to 80386, another four to 80486DX, and four more to the first Pentium.

The reason that Intel could take its sweet time and release generally modest speed increases between generations was that it effectively had no competitors in the PC market. Or so it thought.

Because of this, it went down a simple route of increasing the core clock speed of its designs and even created an architecture called 'Netburst' that would enable its chips to reach 10GHz, theoretically.

The problem was that the focus on GHz above all else was an entirely marketing-driven notion, rather than a technology plan, and eventually it came back to bite Intel hard.

AMD had made small inroads in the enthusiast market with its Athlon and Duron processors, selling mostly on the notion that they might not be the fastest, but they were certainly the best value.

AMD then launched the Opteron in September 2007, and Intel's well-regimented world got inverted, as it became obvious that its Netburst technology was a technological dead end with very poor power efficiency.

AMD's new processors had lower clock speeds but trumped Intel's in benchmarks, by doing more in a single cycle. Baked into the design were also multi-core and multi-processor concepts, and they were also 64-bit CPUs.

They weren't the first 64-bit processors, since many of the MIPS and SPARC workstations chips had those addressing powers two decades earlier, but it was the very first x86-64 chip.

Intel had decided long before that it wouldn't be offering a 64-bit version of its X86 architecture, and offered big iron builders like HP and IBM the Itanium instead.

AMD took the X86 instruction set it had licensed from Intel and created a 64-bit super-set that it called x86-64. While not

a huge improvement to overall processing power, 64-bit was the key to having more than 4GB of RAM in PCs and also to having apps that could address more than 2GB of memory.

Through this one feature, we now commonly have 64-bit versions of Windows and Linux, and Intel was forced to incorporate much of the AMD x86-64 model into its processors. There are some minor differences between AMD and Intel's X86-64 implementation, not least that Intel calls it Intel64 and not AMD64.

“ Problematically, the focus on GHz above all else was an entirely marketing-driven notion rather than a technology plan, and eventually it came back to bite Intel hard ”

The introduction of the Opteron ultimately ended the Netburst adventure and inspired Intel to create the Core series of processors. That ended the GHz wars, made 64-bit mainstream and for a short time gave Intel some of the proper competition it deserved.

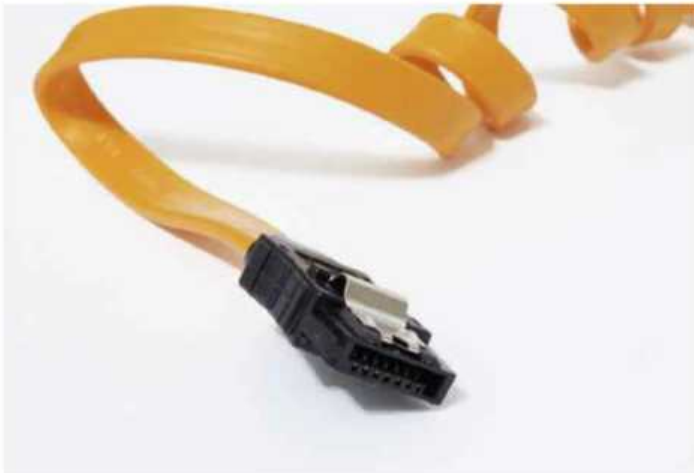
SSD

When I first got a hard drive, they were called 'Winchesters', after a design of magnetic disc storage solution that IBM developed in the 70s. But the idea of using discs to store data using electro magnets dates back to the 50s and possibly before that.

The development of the hard drive saw it go in various directions, where they increased the size and number of the platters, before then attempting to increase the density of the data stored on those discs.

The problem that all designers of drives faced was that as a physical mechanism, they're more likely to





experience failure than a purely electronic device. The more data that was squeezed onto a disc, the greater the potential for corruption. And the speed of writing and reading isn't linear. As the edge of a spinning disc is moving more rapidly than the centre, where on the disc the data is placed can affect performance.

What was good about hard drives was that they were generally reliable enough, they were cost effective, and they could hold plenty of data on a cost per megabyte (then gigabyte) basis.

What was realised in the 1970s was that you could make solid-state storage, using RAM and later NAND memory, so that many of the problems with conventional hard drives just didn't apply.

Unfortunately, a whole bunch of new problems came with these solutions, the biggest of which was the huge price. SanDisk made one of the first SSD drives in 1991, and with just 20MB of capacity, it cost \$1,000.

What was needed to make this a practical proposition was much larger NAND chips at dramatically lower prices, and also some means to address the limited repeated use lifespan of NAND memory.

It took the best part of 20 years to solve all those problems, but these days, high-performance SSDs are affordable and reliable. They plug directly into the same connections as conventional hard drives and can be used as a direct replacement. They still cost more than a hard drive per gigabyte, but not so much that they're unaffordable.

In terms of capacities, new 3D stacking NAND structures are allowing for 2TB and even 4TB drives to be made available by SSD makers, and the advent of PCI Express connected drives has driven performance to amazing levels.

The very best hard drives can manage 200MB/s, whereas the cheapest SSD can easily double that, and PCIe connected ones are ten times quicker or more.

From this point forward, SSDs are going to get even cheaper, faster and will eventually supplant hard drives almost entirely.

Serial ATA

It's difficult to remember how many computers I fixed purely by ripping out the IDE cables and replacing them with fresh ones. It was plenty, because as a drive connection technology, the ribbon cable was probably the worst possible choice imaginable.

Parallel ATA, as IDE was officially called, consisted of a 40-wire ribbon cable with two blade connectors on one end

and a single on the other. They could be used to connect two hard drives, optical drive or a combination of the two, if one was set to be the 'master' and the other the 'slave'. Cables broke, some devices insisted on being 'Master', and occasionally others bickered on the interface so much that they both failed to work correctly.

Eventually everyone in the PC industry got completely sick of IDE and the Serial ATA International Organization set about creating a new technology that used (like USB) a much smaller number of wires to deliver superior results.

SATA version 1.0 appeared in 2003, and it was soon obvious how much better it was than the technology it replaced. Connections and disconnections were so much easier, they put less stress on the cables and drives, and they didn't obstruct the airflow through the case like wide ribbon cables.

The only slight disappointment with SATA was that initially it only supported 1.5Gbps, a very similar speed to the best PATA/133 speeds on ribbon cables.

The advent of SATA revision 2.0 (3Gbps, 300MB/s) and then SATA revision 3.0 (6Gbps, 600MB/s) addressed those issues and also ushered in the SSD era that I've mentioned elsewhere. The latest incarnation of SATA is version 3.2 and that promises to connect drives at up to 1969MB/s.

The other contribution of SATA was the eSATA port, allowing drives to exist outside the PC case while maintaining the performance level as if they were internal.

It would be fair to say that eSATA has been somewhat overtaken by USB technology, though many people still use it to connect external drive arrays.

The success of SATA has been down to it delivering on the reason for it existing in the first place, having backwards





compatibility with earlier versions and it being flexible enough to cope with expanding requirements.

In all those respects, SATA is the technology that has contributed most to modern machine reliability, possibly above all other changes.

Universal Serial Bus

People older than 30 years may remember a period when the PC had a great number of odd connections on it, many being specifically for one type of peripheral.

“ When AMD launched the Opteron and Intel realised the scope of its mistake, it was the team behind the Pentium M and its power efficiency that it turned to ”

Printers connected by a parallel port (Centronics), plotters and modems via RS232, and scanners by SCSI or entirely proprietary card connections. Also, mice and keyboards had no common connectors.

While this did have the advantage that it was relatively straightforward to cable up a PC, the technologies used in each of them were generally poor and unreliable. There was also another underlying issue to do with interrupts in the PC, where only so many devices could be managed at any one time without clashing with each other.

The answer was the Universal Serial Bus, a concept developed by a consortium of Compaq, DEC, IBM, Intel, Microsoft, NEC and Nortel, with the objective of making peripheral connection as easy as possible.

USB was designed to make the cables simple, just four wires and therefore inherently reliable. It had a chainable structure, allowing for, in theory, 127 devices to be connected via hubs. And it was also built so that peripherals could be connected and disconnected without rebooting the PC, critically.

When USB 1.0 first appeared in 1996, it would be fair to say that it was something of a mess, because most PCs

didn't come with it, Windows 95 didn't inherently support it, and devices often didn't work well together. Many of these problems were addressed in version 1.1, and from that point onwards keyboard, mouse, printer and scanner makers embraced the new connection technology with a vengeance.

What's important to realise is that USB 1.1 only supported a top speed of 12Mbps – not remotely quick enough for file transfers, so tape backup drives still used SCSI.

Seeing the potential, USB 2.0 came along and whacked the top speed up to 480Mbps, a level where all manner of external storage and video technology could use the interface effectively.

Without USB 2.0, we probably wouldn't use flash drives, and connecting external hard drives would be more expensive and therefore less common.

But probably the greatest gift of USB was the elimination of unreliable connections and proprietary solutions, both of which blighted early computing.

These days, we've got USB 3.1 and Type-C, and USB is here to stay, because we all expect to pick up a device and simply plug it into a port for it to work. USB is the technology we trust to make this happen.

3dfx Voodoo Graphics

When games consoles first appeared, the selling point of these devices was that you could play arcade games (or copies of them, generally) at home without encountering a coin slot.

The number of reviews at the time that claimed that games were 'arcade quality' was significant, even if most people realised that however well you programmed the Vic20, it wasn't going to be an arcade machine.

There was a good reason for this, because arcade machines contained not one but numerous processors, some allocated purely to generating sound! Custom silicon and massive amounts of RAM also played a part in making them both superior to home gaming and substantially more expensive to own.

While the 16-bit consoles got much closer to the arcade experience, the speed, scale and fluidity of arcade machines seemed to have the edge.





Then in 1996, a small company started by ex-SGI people, called 3dfx Interactive, launched a product that genuinely gave arcade graphics a run for their money.

To be clear, the Voodoo Graphics chip it created wasn't the first dedicated GPU, and other cards used Rendition and Tseng Labs silicon, but when the Voodoo Graphics card appeared, it kick-started a revolution in PC graphics that continues today.

Prior to this era, all PC games used its CPU to do all game graphics and the VGA display model to present them. As a result, most games were limited to 256 colours, low resolutions and relatively poor frame-rates. Also, the whole experience was limited by the amount of CPU power available.

This all changed within a very small amount of time, as game developers embraced the massive amounts of acceleration a dedicated GPU could offer, in terms of both the frames generated and the quality of the images.

The Voodoo Graphics card had 16-bit colour (24-bit came later), 4MB of its own EDO RAM and a 3dfx GPU that ran at 50MHz. Instead of providing both 2D and 3D graphics, it did only the latter, and it was designed to sit alongside a 2D card for creating the desktop display. For a game to use this power, it had to be coded to use 3dfx's own Glide API or OpenGL, because DirectX hadn't yet been devised.

Games that used this technology were a revelation. Smoothly moving 3D worlds with lighting and reflection mapping all came to life, and VGA got swiftly kicked to the kerb.

By 2000, the company that started this revolution was facing bankruptcy and was bought by Nvidia. Other players would then carry the GPU development banner onwards. But anyone who owned a Voodoo Graphics powered card in this era will remember 3dfx as the company that changed the face of PC gaming.

PCI Bus

One of the critical features that made the PC so successful was its bus architecture, mimicking the way that IBM designed its mainframe and minicomputers that preceded it.

By providing a direct means to access the processor and memory, the bus could be used to add complex functionality to the PC that could then be accessible to software written to exploit it.

The first slots that the PC had were the IBM AT bus, which later became known as the Industry Standard Architecture (ISA). In a rather blatant attempt to wrest back control of the PC industry, IBM created MCA (Micro Channel Architecture) as a replacement in its PS/2 systems, and users completely hated it. Or rather they didn't care for the poor reliability levels and high cost of MCA cards.

Simultaneously, an extended version of ISA was also developed, EISA, which only gained any traction with server designers.

The design of the PC gravitated towards a layout with a number of general purpose ISA slots and a single specialist VESA Local Bus slot for the video card. This wasn't an ideal situation, limited the ways that video cards could be installed and divided up the available bandwidth between two distinct bus systems.

What the PC desperately needed was a new slot – one that was cheap to make, easy to use and generally reliable for those using multiple cards in their system.

And in 1990, work began on Peripheral Component Interconnect (PCI) at Intel to provide a universal slot that could be tailored to deliver the right amount of bandwidth for each card's specific needs.

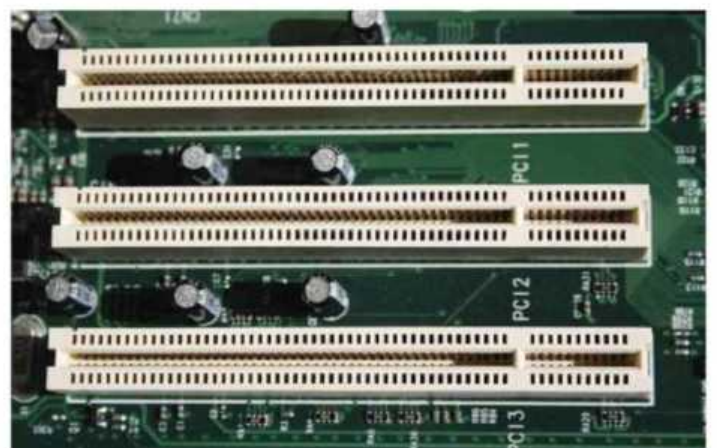
But the really clever thing about PCI is that any card connected to it operates as a bus master, can directly access locations in the CPU address space and, through those, work

“ People older than 30 years may remember a period when the PC had a great number of odd connections on it, many being specifically for one type of peripheral ”

with it and other PCI devices. Over time, it evolved from being a 33MHz bus 32 bits wide to a 64-bit variant and a 133MHz clock with PCI-X.

Using it, the PC was able to become a platform where the cards installed had a means to deliver all manner of capabilities to the PC, from high-performance graphics acceleration to hardware RAID arrays. However, the increasing demands of video technology spawned the AGP slot and the redesign of PCI to genuinely become the all-purpose bus.

PCI became the foundations on which PCI Express got built, the slot we use today – though many motherboards still carry a legacy PCI slot.





Originally introduced in 1992 (PCI Express came along in 2004), for 12 years it completely dominated card technology.

The major change that PCI Express introduced was that like SATA and USB, it did away with lots of parallel interconnections for a high-speed serial link divided into 16 lanes on an x16 slot. The lanes are part of a point-to-point layout that allows for maximum flexibility of bandwidth resources and intercommunication.

In comparison with PCI, a PCI Express x4 slot has the same bandwidth as the whole of the PCI-X 64-bit bus, though you can still add other cards to the PCI Express PC without significantly impairing performance.

PCI shaped the form of the modern PC 24 years ago – a testament to the clarity of thinking and purpose that its engineers exhibited in its creation.

Pentium M

I was tempted to add the original Pentium in here, but instead I've gone with the Pentium M for some very important reasons. At the time it arrived, Intel was neck deep in the mess of its own creating called Netburst Architecture, with the P4 and all its power-sucking kin.

Developed in Intel's R&D centre in Haifa, Israeli, the design team there took the Pentium III chip design (Tualatin) and reworked it substantially for low power operations. The intention was to create a new platform for mobile computers and nothing else.

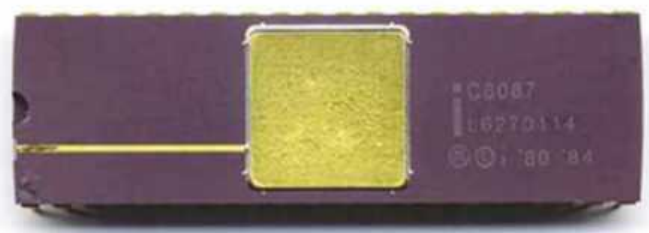
In this respect, the new CPU was a direct descendent of the classic Pentium Pro and nothing to do with the horrible P4 'Willamette' ancestry that ended with 'Prescott' cored chips.

The Pentium M first appeared in March 2003, initially under the Intel Carmel platform name, which was later to become Centrino. This brand became the hottest ticket for those who wanted a PC platform with a realistic battery life. Depending on the clock speed, a Pentium M could use between 5W and 27W.

Coincidentally, when the Pentium M was launched, Intel also had the Pentium P4-M, a chip based on the P4 that used up to 35W, and that failed massively.

When AMD launched the Opteron and Intel realised the scope of its mistake, it was the team behind the Pentium M and its power efficiency that it turned to. Core Duo and Core Solo were both based on an enhanced version of the Pentium M and not the P4 or its mobile counterpart.

Without the Pentium M, Intel might have dug a hole so deep with Netburst that it would have never got out of it, so



it's the chip that saved it from the foolishness of its own ambitions.

This chip is why you can buy a laptop with a full working day of battery life these days, and why your desktop PC doesn't need a BTX case with an accompanying fridge to keep it cool. And because of that, it deserved to be mentioned.

Intel 8087

If you're old enough, you might have heard of the Intel 8080 or 8086, because these were the original PC processors that started the whole X86 instruction lineage. But Intel also made a chip called the 8087 that had huge ramifications, even if many people weren't aware of it.

In the late 70s, all 8-bit computers did floating point mathematics with processors that could only do integer maths inherently. If you wanted to multiply two floating point numbers, you needed to first move the point, so they became huge integers, do the multiply (hoping it wouldn't overflow) and then readjust the point position of the answer.

If that sounds horrible, it was. Dividing numbers was even more challenging, and some maths functions were a complete nightmare with only integer maths. This made software that needed to do floating point calculations very slow and memory dependent, which is why anything rendered in 3D at this time took eons to do.

Realising that there might be a market for help with these problems, Intel designed the 8087 to work in conjunction with its new 8086 processor, specifically to handle the floating point maths.

Depending on how tough the problem was, the 8087 might be just a little quicker than the 8086 or up to five times faster, delivering a then-impressive 50,000 flops.

Yes, that's flops, not megaflops or gigaflops.

It would have been faster, but Intel didn't understand how to implement concurrency at this time, so the CPU would wait patiently for the 8087 to do its work before continuing.

IBM kindly obliged Intel by adding a coprocessor socket to its latest PC motherboard, and sales of the chip soared among those who used them for CAD or complex spreadsheet calculations.

Over the 80286 and 80386, Intel continued the idea of having a separate processor for floating point maths, but eventually realised that almost every piece of software would be helped by having this facility.

From the 80486 onwards, every Intel processor had the floating point instructions included on the CPU, and what was an extension of the X86-16 instructions set became a standard feature.

Floating point was a rather obvious development seen from our perspective now, but at the time the whole idea of a coprocessor seemed a radical notion and of limited application. Thankfully, Intel pursued this direction, because it would make programmers lives significantly easier in years to come. [mm](#)



Brits Watch TV On Toilet

Shocking behaviour...

Kickstarter Campaign For New Arcade Shooter

Playable demo lets you try before backing

Everyone loves an arcade shooter, right? Here's another entry into the genre's cannon and it's thanks to indie developer Jonathan Port and backed with help from software company Hewson Consultants. You may remember them – they were the guys behind a whole host of 1980s titles, including *Uridium* and *Cybernoid*.

So the game, *Hyper Sentinel*, launched on Kickstarter on July 1st and it's ostensibly an arcade space shooter harking back to good old days when bits were bits and gamers were, erm, well... anyway. The initial aim is to bring the game to PC and iOS, with stretch goals including additional platforms like Android and console releases along with level editors and retro platform-specific colour palettes. *Hyper Sentinel* features 12 action-packed levels, exciting power-ups and epic boss battles, all delivered at 60fps.

This ultra-fast shooter will have online leaderboards, three difficulty modes and 60 medals to compete for and you can read more over at www.hewsonconsultants.com/hyper.

If this is your kind of thing, take a look.



Broadband has been responsible for many good things. Perhaps one of the not-so-great achievements of super-fast connections, though, is the move towards watching online television wherever we like, including in the bathroom. Is nothing sacred?

The BBC Store commissioned a piece of research in which it undertook a study of 2,000 people and found one in four respondents was

found to watch episodes of a TV show while sat on a toilet, while a fifth watch programmes in the bath.

Over half of viewers admitted to using their mobile phone while on the toilet and a quarter of respondents admitted to sneaking away from housemates or family members to slyly watch of favourites programme – comedies are the favourite for streaming.



I, like most people, appreciate a bargain. But I've noticed a lot of 'sales' that I see advertised aren't actually very impressive. Whether it's £10 off something that costs £200 or 10% off something that costs £3, these kind of cuts simply don't encourage me to make a purchase.

However, there are some genuinely worthwhile price reductions on technology, and a lot of them are on refurbished items. A few months ago, for example, I got myself a fairly decent Android tablet for more than £100 less than it would have cost me new. And because it was refurbished well, it looked as good as new. It also came with a six-month warranty from the seller, so I knew I was protected if there were any problems with it.

For them, of course, it's a way of clearing returned stock and making some money back at the same time.

It really is a win-win, then. You might get the very latest kit, but if saving money is a priority, it's a great route to take.

If you've ever grabbed an amazing refurb deal, write to letters@micromart and tell us all about it.

Anthony

Xara Updates Designer Pro Package

Year-round updates for web design software

If you want to get your hands on a WYSIWYG web design package, you might want to give Xara's Designer Pro X a look. The latest version now falls under the company's 365-day updates plan meaning that there's no need to wait for a whole 12-months before benefitting from new features and content as those updates will take effect as and when Xara issues them.

As for the software itself, Xara proudly boasts that Designer Pro X combines web design, vector illustration, photo editing and page layout in one design tool, essentially leading to faster performance

with no switching between programs, lower memory and computing requirements, plus an easier learning curve. Its photo editing tools have been enhanced for this update with a couple of new W3C standard transparency blend modes and non-destructive photo editing – so you can return to the original image at any time.

Also, Xara SmartShapes allows for quick creation and editing of commonly-used shapes, while flexible text handling has been tweaked with the software's Font Awesome collection of symbols updated to provide over 1,500 symbols in total. Then there are the new parallax scrolling effects, 30

types of scrolling animation, nine new general website themes and 166 business theme sets... we could go on, but we won't. Instead, why don't you just visit www.xara.com if you're interested where you'll find this available for £219 (£75 if you're upgrading from Designer Pro v11).



Meanwhile... On The Internet...

In last week's Meanwhile we talked at length about the Facebook timeline (tinyurl.com/MMnet22a), the theory of the 'echo chamber' (tinyurl.com/MMnet22b) and how, in a world where significant numbers of people are beginning to rely on social networks for their news, what appears there is becoming increasingly important in terms of influencing attitudes (tinyurl.com/MMnet22c). Last week, similar issues came to light with regards to Facebook's Live video service (live.fb.com/about), a feature that it's been very keen to push (tinyurl.com/MMnet22d) following the success of services such as Meerkat (tinyurl.com/MMnet22e), Twitter's Periscope (tinyurl.com/MMnet22f) and YouTube Live.

The controversy surrounds a particularly harrowing video shot in the wake of the shooting of Philando Castile in Minnesota, USA (tinyurl.com/MMnet22g)*. It showed the horrific aftermath of an incident that started with Castile being stopped by police for having a broken rear light on his car, and ended with him being shot four times through the window of his vehicle, while his girlfriend, Diamond Reynolds, and his four-year-old daughter looked on in shock.

Despite the circumstances, Miss Reynolds showed enough presence of mind under almost unimaginable pressure (tinyurl.com/MMnet22h), to immediately start to film the scene unfolding, using Facebook Live as the medium. Her stream started while the officer still had his gun raised and pointing into the car, and depicted her initial calm, no doubt shell-shocked demeanour slowly disintegrate into helplessness and distress as she realises the consequences of what has happened, and that her partner has in fact died. The video lasts for ten awful minutes, yet it has been watched 5.1m times on Facebook at the time of writing (we won't link; you can find it if you must). That's not just because of the ghoulish curiosity of some internet denizens, but because it is another bona fide testament to an obvious schism in US society regarding the perceived treatment of people of colour by law enforcement.

However, for a while, the video mysteriously disappeared from the social network (tinyurl.com/MMnet22i). That this happened just as Reynolds' shocking footage was beginning to go viral, and protests were beginning to happen regarding the police's action in this tragic event and the death of Alton Sterling in Baton Rouge, Louisiana (also caught on video: tinyurl.com/MMnet22j), immediately elicited a variety of angry reactions.

While many were busy raging at the idea that Facebook was censoring the content (especially as it could prove vital to any later investigation), the firm quickly made statements claiming that the deletion of the video was a "technical glitch". However, contrary to this, the *Register* was quick to cite multiple sources alleging that the removal of the video was in fact due to an intervention by the police (tinyurl.com/MMnet22k). That's potentially an even more serious state of affairs, and a scary prospect. But it backs up Miss Reynolds' assertion that the police took her phone and accessed her Facebook account (tinyurl.com/MMnet22s) in the aftermath of the events in an attempt to tamper with the evidence in order to exonerate themselves (tinyurl.com/MMnet22l).

It's becoming increasingly noted that video and streaming technology could have a significant calming effect on the way police act against people of colour in the US (tinyurl.com/MMnet22m). This has been a hot topic for more years than any of us care to remember (tinyurl.com/MMnet22q). However, it was especially prevalent after the shooting of Michael Brown in Ferguson, Missouri (again, an incident caught on video), the subsequent civil disorder and the rise of the Black Lives Matter (blacklivesmatter.com) movement over the past couple of years. And there's also the mistrust (tinyurl.com/MMnet22n) that exists over the police's use (or not: tinyurl.com/MMnet22o) of video technology (tinyurl.com/MMnet22p) to provide better evidence when allegations are made such as those in this case.

In the wake of these events, expect the role of social media in shaping public perception of so-called 'hot button' issues to become an increasingly active battleground as the technology advances and gets into the hands of more people. What's more, it's unlikely to be a debate restricted to the other side of the Atlantic (tinyurl.com/MMnet22r).

Allied to this will be the debate about how to manage live streaming sites, if possible, in the light of events such as this – which are probably well outside the problems that their creators foresaw when coming up with the idea and the technology in the first place. So while events that have transpired in Minnesota and Baton Rouge in the last week may seem a long, long way away, their repercussions will resonate in our society too, and certainly within our social networks (tinyurl.com/MMnet22t).

*** Warning – the edited video here masks the most graphic content but auto-starts, so if you don't want to see it at all, avoid the link**

.AVWhy?

If you haven't come across the musical phenomenon that is the Broadway musical *Hamilton*, then we'd strongly recommend that you put it on your listening list. The brainchild of Lin-Manuel Miranda, it's come a long way since a far less hirsute, callow version of its creator debuted his rap-driven telling of the life story of one of America's founding fathers to an almost incredulous Barack Obama at the White House (tinyurl.com/MMnet22u). It's since grabbed a bag full of Tony Awards, become the hottest ticket in New York, assured itself a run in the West End starting in 2017 and launched its creator to stardom (tinyurl.com/MMnet22v).

Thus, with a million things now on his agenda (chiefly a role in the upcoming Disney *Mary Poppins* sequel) Miranda made his last appearance in the eponymous role last weekend, and a few days before he performed his last #Ham4Ham duties outside the musical's home on Broadway (tinyurl.com/MMnet22w). This series of crowdpleasing impromptu performances outside the Richard Rogers theatre are the precursor to a hotly contested weekly public lottery for tickets, and have become almost as beloved among fans as the musical itself – featuring, as they usually do, Miranda and various guests (tinyurl.com/MMnet22x).



Caption Competition



"The boss has taken ill, but he seems to in a stable condition now"

Issue 1419 offered up this image for your captioning pleasure, here's what you sent us...

- **Sawboman:** "We have a hot tip for a new product, straight from the horse's mouth."
- **EdP:** "I always thought that the other end was far more appropriate!"
- **doctoryorkie:** "The doctor said this tablet would make me a little horse."
- **doctoryorkie:** "Voting on the mane issue – the neighs win it by a nose."
- **JayCeeDee:** "He made me an offer I couldn't refuse."
- **ricedg:** "Okay, that's settled then Mr Gove. £350 million a week to the National Horse Service."
- **Sawboman:** "We warned the boss to stop nagging."
- **BullStuff:** "I did say that the stable door to the CEO's office had not been bolted..."
- **Dwynneugh:** "Lions led by donkeys."
- **The VFM Addict:** "The Labour Party commissions a new Gallop poll about its leadership problems."
- **Think Tank:** "Is he wearing those teeth in for a horse."
- **wyliecoyoteuk:** "The new Reddit CEO."
- **Thomas Turnbull:** "It's a one horse race for the leadership of the Labour Party."
- **Allan Gregory:** "Let's outsmart the Republicans by lowering the tax on mouse food."

Thanks for all your entries. This week's winner is Thomas Turnbull, with "The boss has taken ill, but he seems to in a stable condition now." If you have a caption for the picture below, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk), or email us your funnies via editorial@micromart.co.uk, remembering to add the issue number to the email subject line.



Apple Wins Approval For Gig Filming Blocker

No bad thing, perhaps?

A few weeks back, singer Adele reportedly chastised an audience member for filming her show on a mobile phone instead of simply being in the moment. If you've been to any concert recently, you'll be all too aware that this is an increasingly annoying trend.

Apple has now won approval from the US Patent and Trademark Office for a piece of technology that could stop audiences from filming concerts, or even from taking photos of concerts via their iPhones. The patent relates to how infrared light could be used to prevent filming from taking place, with the patent writing: "For example,

an infrared emitter can be located in areas where picture or video capture is prohibited, and the emitter can generate infrared signals with encoded data that includes commands to disable the recording functions of devices. An electronic device can then receive the infrared signals, decode the data and temporarily disable the device's recording function based on the command."

Such a technology could, of course, have uses for the anti-piracy movement. It would also, bluntly, be welcomed by plenty of other audience members who just want to enjoy the show rather than having to watch it through someone's phone right in front of you.



Snippets!

New Surface?

According to some online conversations, Microsoft is working on a new addition to its Surface range. Very little else is known about the device, with some suggesting an all-in-one system and others a dedicated desktop system, but it's thought that it will likely be released next year. As we said, little else is known but can see this competing in the upper end of the market.

Will it be all surface and little substance? Ho, ho. Hum.

Blizzard's Diablo Plan

So, Blizzard is hiring and it's looking for a Game Director for the latest game in the *Diablo* series. An advert for the role, posted on its website, was picked up by a few online sources and it reads: *"Blizzard Entertainment is seeking a game director with outstanding communications skills, proven experience in creative direction, strong ability in system design, and a stellar track record of shipping AAA games to lead the Diablo series into the future."*

If you are capable and okay with a move to California, why not apply?

Megaprocessor, Done

A chap who was building an absolutely massive computer in order to demonstrate how a microprocessor works has finished, and it really is massive. In fact, James Newman's project measures 33ft by 6ft and consists of 40,000 transistors, 10,000 LED lights. And how is it being used? To play *Tetris*, of course. Brilliant. The build is clearly pretty special and the components light up when the megaprocessor is working its way through a task. The BBC has quoted Newman as saying he hopes it will go to a museum or place of education. Well, it's a bit big for his house.

US Lawsuit Claims Apple's Devices Infringe 90s Designs

\$10bn suit on the table

Media reports have picked up news of an American businessman who has filed a multi-billion-dollar lawsuit against Apple over a claim that the iPhone, iPod and iPad have all infringed on his invention, the Electronic Reading Device (ERD).

Thomas Ross's ERD was invented in 1992, represented legally by three hand-drawn sketches of technical drawings. Ross filed a patent in the same year and the ERD was going to have a backlit screen and would have been used as

a reading device, much like those so many of us use today. His device never came out of this very rough design stage, though – and, while he did apply, he didn't pay the fees so his patent application was abandoned in 1995. As a result, Ross is using copyright law to try to win his case, stating that he feels that Apple's devices are the "essence" of his Electronic Reading Device.

The images from his patent have been posted at various places online so see for yourself if you think he has a case.



First Self-Driving Fatality

Tesla driver in Florida crash

Joshua Brown died in May during a test drive in one of Tesla's self-driving cars. The test driver is the first fatality relating to self-driving vehicles and the truck driver involved in the crash told the Associated Press that Brown was driving so fast that "he went so fast through my trailer I didn't see him".

The Associated Press report on the crash also quoted the truck driver as saying that Brown was watching a *Harry Potter* movie on the TV screen at the time (apparently he could hear the movie playing). Obviously, this incident has brought to light all sorts of questions about safety and self-driving vehicles and, while Tesla's Elon

Musk has sought to place the crash in context of the number of crashes that occur on America's highways every year, it's unlikely that the questions won't keep on coming.

In a blog statement, Tesla said that the car's sensor system couldn't make out the truck and its trailer against a "brightly lit sky" that was crossing the highway at the time so the brake wasn't applied.

In other Tesla news, the company has missed its vehicle delivery targets for the third quarter in a row. With shares also down by 13% over the past quarter, times have been better at Team Tesla.

Orchestral Manoeuvres From Bandai Namco

Live performance of video game music? Yes, please

Bandai Namco is launching a series of concerts that will feature live performances of some of the company's most emblematic and memorable music pieces from its game franchises. 'Orchestral Memories' will be performed by over 80 musicians on stage and produced by veterans of this kind of thing, La Fée Sauvage.

It is a group of musicians that has handled performances of music from the likes of *Final Fantasy* and *Kingdom Hearts*,

so it knows what it's doing. This time the orchestra and choir, supported by HD video game footage, will dive straight into *Dark Souls*, *Soul Calibur*, *Pac-Man*, *Ace Combat*, and more.

The tour kicks off in Paris, and it's not clear if the UK is on the itinerary at the moment. We hope so, and fingers crossed someone – will get to deliver the immortal words: "Transcending history and the world, a tale of souls and swords, eternally retold."

Find out more with a visit to www.wildfaery.com. He

Evernote Upsets Users Over Restrictions

Free accounts affected

Evernote Basic will now only sync across two devices, meaning that users needing to sync across more will have to pay for the service for the first time.

Not only that, but users of the Plus and Premium tiers of the service will also have to pay more with prices having risen by around 40%. If you are currently a Free tier user and you don't want to spend more, you may decide to look elsewhere? Evernote will be hoping not.

Why the price rises? Well, if the company is going to carry on investing in it and making it better then it's going to need more revenue from its users. Naturally, Basic users have complained – nobody likes to pay for things they didn't have to before, so in a bid to try to keep people happ(ier) Basic users can now also take advantage of a passcode lock feature that was previously only available for paying customers.

Nope, we don't think that's going to cut it either.

Android Nougat, Not Nutella

Yum, yum... For some

So, it's not Nutella after all. Despite some speculation that Google's latest version of Android might indeed be called Nutella, it turns out that the N actually stands for another sugary treat: Nougat.

Google's big reveal of version 7.0 of Android included the unveiling of a green statue of the Android mascot standing on top

of several bars of nougat and the company said that the release would be made final during the third quarter of the year. As for features, Nougat will have a redesigned UI and VR support among various improvements.

Not sure we're keen on Nougat, in all honesty (the name, not the tasty treat – we rather like that). It was nominated by a member of the general public, though.



Overclockers Titan ForceBox VR10

A virtual reality ready PC, with the second most powerful GPU in the world installed

DETAILS

• Price: £916
Manufacturer:
Overclockers UK
Website:
goo.gl/FKkh80
Requirements:
Keyboard, mouse,
monitor

With the rebirth of virtual reality now in full swing, thanks to the HTC

Vive and Oculus Rift, the PC scene has had a spring put back into its step. Fuelling this new generation of interaction and immersion are more powerful graphics cards, and increasingly better designed PCs with which users can get the best from VR content.

Overclockers UK is certainly no stranger to building a high-end gaming setup, and its current batch of systems includes the Titan ForceBox VR10, an exceptionally stylish gaming PC with some pretty impressive components designed just for that task.

It starts with an excellent foundation on which to build: an Intel Core i5-6400 processor, running at 2.7GHz. Regarded as one of the better sixth generation gaming CPUs, its complimented with 8GB of DDR4 2400MHz memory, and a 120GB Kingston V300 SSD for the primary drive. It has Windows 10 64-bit Home edition pre-installed, and bulks up its storage offering with a secondary 1TB Seagate Barracuda drive.

The icing on the Titan ForceBox cake, though, is one of Nvidia's new line of graphics cards: specifically, the GTX 1070 Founder's Edition from



▲ The Overclockers Titan ForceBox VR10 is an exceptional gaming setup



▲ At the heart of the gaming performance is the GTX 1070, a superb GPU

Gigabyte. The the design is the less powerful sibling of the GTX 1080, that doesn't mean it's lacking in graphical grunt. In fact it shares the same Pascal architecture DNA as the 1080, but at a considerably lower cost.

With 8GB GDDR4, a GPU clock of 1506MHz and a boost clock of 1683MHz, 2002MHz memory clock, 1920 CUDA Cores and a modest TDP of just 150W it's a wise choice of gaming GPU for those looking to reap the benefits of VR gaming, while still staying on something resembling a budget.

Needless to say the combination of processor, memory, storage and the GPU make for a unique gaming setup. Our 3DMark 11 tests recorded a score of 15493, which translates to seamless full HD, 4K and naturally, VR gaming. Frames per second in the likes of *GTA V*, *Star Wars Battlefront*, *Fallout 4*, *The Witcher 3*, and *Doom* were at a constant 100-plus when in 1080p, and only dropping to an average of around 80FPS when run at 1440p. VR titles too were excellent, without any hint of a performance issue when using an

HTC Vive. In short, the GTX 1070 is faster than a Titan X – and cheaper – and would appear to blow every other single GPU (except for the 1080) option out of the water.

Equally impressive, though, is the build quality of the Titan ForceBox VR10. OcUK prides itself with systems built to a high degree, and the VR10 is a prime example. The Phanteks Enthoo Evolv ITX case provides a compact, but stylish chassis with enough room for some expansion. The ASUS H110I-Plus motherboard doesn't offer too much in terms of future upgrades, but it's ample for what the system is designed for.

Cooling comes courtesy of a large 200mm front chassis fan, and an Alpenföhn Sella CPU fan – which remains remarkably quiet even when benchmarking. Cable management is excellent too, and we even like the green LED lighting strips that emit from the front of the case.

The Overclockers Titan ForceBox VR10 is an excellent gaming PC that'll happily tackle anything you can throw at it. At £916 it's also reasonably priced,



considering the performance and specs of the machine. If you're after a new-generation gaming computer, we can't recommend the Overclockers Titan ForceBox VR10 highly enough. **mm David Hayward**

An excellently designed and built gaming PC



ViewSonic VX2776-smhd

A great consumer screen from a master monitor maker

DETAILS

- Price: £119
- Manufacturer: ViewSonic
- Website: goo.gl/UP5roU
- Requirements: HDMI, VGA or DisplayPort connections

Viewsonic's VX-range of monitors fall under the entertainment section of the company's catalogue of displays. They cater for mid-range gaming, media duties, as well as day-to-day uses such as office tasks and photo or video editing. That may sound run-of-the-mill, but there's nothing average about these consumer screens.

The VX2776-smhd is one of the company's newest entries. This 27" 1920 x 1080 IPS monitor has a lot going for it. An 80,000,000:1 dynamic contrast ratio, 4ms response time, 178° viewing angles on both horizontal and vertical planes, and brightness of 250cd/m² are all splendid looking specifications. However, the emphasis here is on the design of the monitor.

While other monitors offer thin bezels, ViewSonic has gone one step further and eliminated the bezel altogether. The VX2776-smhd is a totally frameless design, bringing the edges of the screen up to an incredibly tight 8mm from the edges of the monitor. Plus, the screen thickness is only 6.6mm at its thinnest point, increasing to 25mm toward the base of the monitor where the connectivity is and where you'll fit the stand.

Speaking of connectivity, ViewSonic has opted for a more generalised set of ports: HDMI, DisplayPort and VGA – no DVI



▲ The ViewSonic VX2776-smhd is fantastic value 27-inch monitor

unfortunately. There are also Line-in and headphone ports, and the monitor does come with a set of half-decent 3W speakers.

The design is certainly an important feature here, and ViewSonic has gone to great

While 'only' full HD, as opposed to 2K or 4K, the quality of the image is startlingly good. The IPS display is of excellent quality, and you get a great and deep range of colours along with a rich black. It's not

“ The IPS display is of excellent quality, and you get a deep range of colour ”

lengths to ensure the rest of the monitor is as up to scratch as the frameless screen. The stand, for example, is a thin wedge that elegantly curves down to a triangular base made of anodised aluminium, with a polished front section displaying the ViewSonic logo in black. This black and silver theme is worked across the entire monitor and, in our humble opinion, looks great.

the fastest monitor we've ever tested, but 4ms is still ample for 99% of users, with only the gaming community possibly noticing.

ViewSonic has also included flicker free technology, Eye-Care technology and a low blue light setting, which results in a better quality screen for prolonged use. In addition to all that this is a remarkably low-power monitor,



▲ The frameless design, and ultra-thin screen make for a stylish setup

consuming just 22W when in normal use and dropping to 17W in ECO mode.

While this 27" IPS monitor has great looks and specs, what's even better is the fact that the RRP is just £119. That's cheap enough to have a dual monitor setup with a pair of frameless screens, which in our view is worth every penny.

mm David Hayward

An excellent monitor at an extremely competitive price



BenQ XR3501

Improve your view, with a curve

DETAILS

- Price: ~£680
- Manufacturer: BenQ
- Website: goo.gl/v43bIE
- Requirements: HDMI, DisplayPort, mini DisplayPort source

Although curved monitors have only been with us for a relatively short while, they're beginning to gain ground on the desktop gaming scene – especially among fans of racing games. We've had a few through our doors in recent months, and each has impressed us. The BenQ XR3501 is a cut above your normal desktop monitor, though; it's huge 35" curved display is, of course, the dominant feature but the specifications for it are just as impressive.

This 2560 x 1080 resolution, 144Hz refresh rate 8-bit AMVA panel offers a field of vision – thanks to its 2000R curve – equal to that of an IMAX theatre screen. This totally immersive view is kept clear and responsive thanks to 21:9 aspect ratio, 178° viewing angles and 4ms response time.

On top of that there's the collection of eye care features we've come to expect from BenQ. These provide low blue light levels, a Black eQualiser mode to improve darker scenes in-game without saturating and over-exposing the surrounding areas, a 20-level colour vibrance setting for a higher level of colour production and performance, and the BenQ Senseye feature that can automatically adjust the display depending on the light levels.



▲ The viewing angle of the BenQ XR3501 is simply tremendous



▲ Of course, the viewing angle is thanks to the 2000R curve

The design of the XR3501 is exceptionally good. The surrounding bezel isn't too thick, and is made from a matte-black plastic so as to eliminate the reflection and smudging that can occur with a glossy finish. The stand too is sturdy, offering basic tilt to alter the viewing angles for the user. Thankfully the screen itself is mounted quite high on the stand so there's a good clearance and an acceptable, ergonomic, general eye-level setup already in place, somewhat negating the downside of there being no adjustment options.

Connectivity consists of a pair of HDMI ports, DisplayPort, mini DisplayPort, Line-in, Line-out and a headphone port. Built-in to

the XR3501 is the AMD Freesync technology, which pairs any AMD GPU nicely with the monitor to eliminate any screen tearing or signs of lag. You'll need an appropriate AMD GPU, of course, but the effect it has on gaming is well documented elsewhere and surprisingly good.

The monitor is weighty, though, and a little awkward to manhandle into position due to its sheer size. It weighs in at around 11.5Kg, so if you've got a dodgy back you may want to employ another pair of hands to help getting it into place!

The resolution purist will no doubt be balking at the idea of such a large and curved panel only hitting 1080p; why not 3440 x 1440? However

the saving grace on the XR3501 is the refresh rate, which makes for a far better visual experience compared to a higher resolution.

As you can probably imagine the screen quality is quite superb, but the curve does take a little getting used to. Once you get the measure of it, though, you'll enjoy the immersive experience.

Gaming is wonderful with the extra field of vision, and most games cater for the 2560 x 1080 resolution. However, other tasks such as using a word processor or browsing do create great borders of empty space, which look a little strange at first.

In terms of price, the BenQ XR3501 comes in at around £680, which is far from cheap. Mind you, this is a premium product, and not your usual run-of-the-mill monitor. If you're willing to splash out on a top of the range screen, then this is certainly one to take into consideration.

mm David Hayward

Doesn't tick all the boxes, but is still quite incredible



Fujitsu Stylistic R726

Is it a tablet? Is it a laptop? No – it's both, as Michael discovers

DETAILS

• Price: £1543
Manufacturer: Fujitsu
Website:
www.fujitsu.com
Requirements: n.a.

As printers, scanners, fax machines have morphed into multifunction all-in-one devices, so we are seeing tablets and keyboards come together as hybrid devices that attempt to offer erstwhile laptop users the users the 'best' of the new and old form factors. One such product is the Fujitsu Stylistic R726.

Aimed at the mobile business user, the Stylistic R726 consists of a magnetic keyboard unit, tablet, digitised stylus pen, backup CD, two-piece power lead and various pieces of documentation. Providing the software element is a copy of Microsoft Windows 10 Pro operating system.

The tablet part of the equation, which obviously doubles as the screen element when used in laptop mode, has dimensions of 319 x 201 x 9.5mm (W x H x D) and weighs 830g. The screen itself is a 12.5" PLS (Plane to Line Switching) unit encased within a grey magnesium-aluminium chassis. It has a slightly wider bezel running across the top/bottom than the sides of the unit.

An Intel Core i7 6600u CPU processor sits at the heart of the device, running at 2.6GHz in conjunction with an Intel Graphics 520 GPU. 8GB of RAM comes as standard. There's a 2MP camera mounted on the front of the screen with a 5MP unit on the

rear. A 34Wh lithium polymer internal battery provides up to 10 hours of use, although this is reduced to nine hours when the keyboard is attached. Located on the rear of the tablet is a kick-stand for use when the screen is being used in laptop mode or as a screen for media, perhaps.

Arranged down the left side of the tablet are connections for 3.5mm headphone jack, USB 3.0, Mini-Display and AC power. Housed on the right side is a volume rocker control and power button that sits flush to the unit's body. A further two slots, for inserting a micro SD card and SIM, are revealed when the kick-stand is opened. While the screen has pen & touch support, Fujitsu has taken the decision not to include a means of mounting the stylus to the screen when not in use, which is a shame.

To turn the tablet into a laptop you need to attach the screen unit via a magnetic bracket on the rear of the

keyboard. Connecting the two components was easier than I expected. Indeed, I was even able to perform this task by touch alone.

The keyboard has dimensions of 320 x 202 x 5mm (not including the rear mounted connection bracket). Due to the size of the keyboard, there is no space for a dedicated number pad but a substitute is integrated into the main area. There are also specific keys for Home, End, Insert and Delete tagged onto the end of the function keys. I found the keyboard took a little getting use to mainly because of the minimal movement in the keys when typing. A firm flat surface is really necessary when using this piece of kit in laptop mode with its keyboard base and kick-stand giving you an angle of 45°. To be honest, I found it uncomfortable using the laptop balanced on my lap and wouldn't recommend it.

You can use the stylus when operating this device in laptop



mode along with the attached keyboard touchpad, though you can also add a traditional style wireless mouse via the built-in USB 3.0 port.

mm Michael Fereday

Versatile solution, but won't appeal to all



Asus ROG Spatha Wireless/Wired Gaming Mouse

Asus waves its Spatha in the air, like it just doesn't care

DETAILS

- Price: £140 (Overclockers)
- Manufacturer: Asus
- Website: goo.gl/SXhRLS
- Requirements: Windows 7/8/x/10, free USB 2.0 port

Asus has released two other mice under the Republic of Gamer brand: the Gladius and the Sica. For those without a degree in the history of ancient Rome, it's interesting to note that both are named after sword types from that era. Thus, so is the new addition, the Spatha.

Let's get the elephant ejected early in this review, though: this is the most expensive mouse I've ever reviewed for *Micro Mart*. However, having used it for just a few days, I can attest that the quality of the construction and precision of the parts combine to deliver something that actually lives up to its billing – even if the idea of spending so much on a pointing device might seem utterly ludicrous.



Not unexpectedly, the Spatha comes in a high-quality box. Inside it, you will find the mouse and all its accessories are well protected. There's also a hard carry-case included. Rather oddly, though, the mouse doesn't travel in, there's simply not the room, but all the other accessories do.

The Spatha is cleverly designed to be both a wired and wireless design, giving gamers the choice between 2000MHz and 1000MHz polling, with wired having the faster option. In wireless mode the Spatha uses an angled dock as the 2.4GHz wireless connection with that being attached via USB. To charge the mouse you simply drop it on to the dock, and it magnetically snaps into place.

A minor detail I appreciated here was that Asus provide two USB cables, one for the mouse and another for the dock. That means you don't need to disassemble the dock to remove its cable should the battery exhaust in mid-combat.

They also very thoughtfully included a couple of Omron switches and a tool to install

them, should the ones they've installed fail at any point. That inclusion does seem mild overkill, because as Asus's own promotional material points out, these switches are rated for a 20-million-click lifespan.

As pointing devices go this mouse is big. Some justification for this scale is that, to effectively mount the twelve buttons it has, it can't be small unless its intended user base has tiny fingers. Probably not the case. However, the large size (and the 175g weight) make me unsure if this design is ideal for FPS games. However, it worked flawlessly with the simulation and strategic titles I mostly play.

Where this design really excels is in the scope of the customisations available

Features

- Wired or Wireless connectivity
- Optical sensor
- Tracking Resolution: 8200 DPI
- Tracking Speed: 150 IPS
- Tracking Acceleration: 30g
- Polling rate: 2000 Hz (wireless), 1000Hz (wired)
- Weight: 175g
- Omron switches
- Two metre braided cable
- One metre rubber cable
- Wireless dock



through the Armoury application that Asus designed it to work in conjunction with. Every factor imaginable is tweakable, like acceleration/ deceleration, lift-off distance and surface calibration. All the buttons are infinitely definable, and there are even six lighting modes applicable to the three RGB LEDs inside the mouse.

With an 8200dpi sensor there is huge scope for finding the exact ratio that you need between the range of movement afforded and

sensitivity. What's more, you can define up to five sensitivity levels and cycle through them while playing. In addition, by default, one of the buttons toggles the mouse into half the current setting for accurate sniping.

Any changes that you make are stored on flash memory in the mouse and you can define up to five profiles and quickly rotate between them. Once stored on the mouse these configurations are useable on any PC, even those without the ROG Armoury app installed.

If you use it in wireless mode you can realistically expect at least 16 hours out of a fully charged battery, and it doesn't take long to recharge. Obviously wired mode doesn't have any operating life limits, though I'm not really convinced that the higher polling rate would be recognised as such by the majority of humans. This

leaves the real value of wired mode being the help it affords people who can't remember to put a mouse on the charging dock when they've finished with it.

If there is a weakness here it is that the Spatha is made for right handed people, where I presume the sword that it borrowed its name from was effective in either hand. That's a shame, but equally with one of the button clusters built around the position of the thumb in a right handed grip it was never going to be good for left handers without a completely mirrored model.

To get the most out of the Spatha you'll need to do some serious work, because spending this sort of cash and then using it like a typical two-button-and-scroll device would be desecration. Buying one of these is as much about an investment in time and effort as it is in cold hard cash.

I noted this was the most expensive mouse I've ever reviewed, but is it the best? Probably. The combination of finely moulded plastic mounted on a magnesium alloy chassis makes for an intoxicating user experience that evolves with each subsequent use. Those wishing to take their e-sport to the next level should prepare themselves for a not inconsiderable investment.

mm Mark Pickavance

Stunningly designed mouse for those who want the absolute best



8-Bit Armies

Command and Conquer for a new generation of gamers?

DETAILS

- Price: £9
- Manufacturer: Petroglyph Games
- Website: goo.gl/10ZeES
- Requirements: Windows Vista or later, 4GB RAM, GTS250/Radeon HD 3870+

Formed in 2003 by a group of ex-Westwood developers, Petroglyph Games has released some rather splendid titles. *Star Wars: Empire At War* and *Grey Goo* are just two examples of what the former creators of *Command And Conquer* (C&C) produce. Recently the team has released *8-Bit Armies*, a Voxel-based RTS that scratches the itch that C&C once did so wonderfully. But is it any good?

Fans of the C&C series, especially the early games, will feel immediately at home here. You build a base, build a harvester to capture oil reserves that can be converted to cash, build a barracks, a motor pool, aircraft hanger, and – once you've secured your base of operations – you begin to walk your army to the other end of the map to try and wipe out the enemy.

It's a back to basics theme, but it works well. The various missions – 25 in the single player campaign – have you gunning for the enemy across various terrains. In some missions you're tasked with all out destruction, others will have you searching out abandoned research labs to capture, or invading the final enemy base and launching a nuclear attack.

You have two factions to choose from: the Guardians and the Renegades, think of them as the GDI and the Brotherhood of



▲ Build your 8-Bit army, and wipe out the enemy



▲ Graphically, 8-Bit Armies looks great

“Fans of the C&C series, especially the early games, will feel at home”

Nod. Each has its own set of troops, vehicles and so on, but each is evenly matched in terms of individual units.

Although the single-player missions give you a fair amount of time to play the game, they're really there to hone your skills and unlock the tech tree. Moving on from single player, you can then engage other players in eight-player skirmishes across ten different maps, or co-op with

others on 10 different missions. Suffice to say there's enough to keep you playing.

There are moments of frustration, mind you. Units that lack any sense of direction, wander into an enemy turret's line of fire, or that seem to go gung-ho and launch into hand-to-hand combat with a tank before heavier artillery had time to reach them, all call the game's AI into question at times.

Graphically *8-Bit Armies* is quite good, though. There's a vibrant look to the maps and the individual units, with some decent animations, albeit with a *Minecraft*-style look and feel. While not truly 8-Bit, there's obviously a pixel art homage to C&C running throughout the game. This only adds to the fun factor for vets, while introducing a new generation to RTS battles.

Sadly, the RTS genre doesn't seem to have quite the fan-base it once enjoyed. However, despite arguably being a dying game mechanic, the Petroglyph team has done a good job of bringing back some of the enjoyment it can offer. Having said that, the finer details of the strategy element seems to be missing. Where you could once perform pincer-like movements with perfect timing as different units attacked the enemy, *8-Bit Armies* offers a simplified setup that may well turn off old-time fans of the genre.

For non-purists, *8-Bit Armies* will be a fun and engaging game to play. There's enough going on to keep you entertained, and it's reasonably cheap at around £9 via Steam.

mm David Hayward

A fun take on the RTS genre; well priced too



The Last Leviathan

Anchors away, splice the mainbrace, avast, and other such nautical quips

DETAILS

- Price: £7
- Manufacturer: Super Punk Games
- Website: goo.gl/DGmlUc
- Requirements: Windows 7+, 2.2GHz CPU+, 4GB RAM+, 1GB GPU+



▲ Build a fearsome ship and sail the ancient seas of Middenhir



▲ This does tend to happen a lot, unless you're Horatio Nelson

The salty winds of the briny deep and the roar of the shore-bound breakers are music to the senses of those who have something of a nautical flair about them. Personally, I get a little seasick in the bath tub, however, that doesn't mean I can't enjoy exploring the vast stretches of uncharted oceans, from the relative comfort of my office chair.

The Last Leviathan, from developer Super Punk Games, has you exploring the vast oceanic world of Middenhir in search of the titular, monstrous MacGuffin. This physics based game has you play a number of roles: master shipbuilder, explorer, navigator, and tactician, all of which need to be honed to enable you to survive for more than a few minutes.

The game involves you building your first ship from a collection of available blocks, starting with the hull. From there you can then add some form of movement, be that sail and rudder or propellers, and proving the thing can actually stay on the surface of the water for any length of time, you can then fit it out with a selection of weapons.

Building the ship and its components is very much in the same vein as last year's *Besiege*; you can construct the ship, test it in the water, and re-dock to

make any modifications. Once you have a ship that'll stand the rigours of ocean life, you can then set sail in several scenarios: Creative, a sandbox world to discover; Battle Seas, which has you battling pirates of ever increasing difficulty; Versus, which has you battle other players' built ships; and finally Events, which tasks you with destroying another ship within a certain time limit. Another mode, Voyage, will allow you to set sail and navigate the world in a kind of survival mode. However, that mode isn't available at this early stage.

Being a physics-based builder means you're more likely to spend a lot of time in the design and rebuild stages of the game

than out at sea, at least to begin with. Constructing a seaworthy ship complete with weapons, rams, spikes and a number of powerful propellers takes time and patience, especially when you drop it in the sea and discover that it's anything but seaworthy. The effects can be both frustrating and comical, and it's not long before you come to realise that you're anything but a master shipbuilder.

The environment is beautifully rendered, though, with the movement of the sea and the detail in the smaller elements of the game of course. The physics side of things, of course, ties everything up in a neat, interesting, and thoroughly

absorbing game that will have you coming back for more – even after you've suffered a humiliating defeat by someone piloting a rowing boat.

The Last Leviathan is a Steam Early Access game, so expect unpolished elements to crop up every so often. Having said that, I didn't find anything game-breaking during my time with it. Super Punk Games has done a good job. It may not appeal to everyone's tastes, but for those who want to expand beyond construction games like *Minecraft*, it's a perfect match, where the added gameplay elements – with more to come – enhance an already decent title.

mm David Hayward

An interesting, physics-based building game with plenty to do



BUYER'S GUIDE

AMD FX Processors

AMD FX Processors

AMD FX-6300 3.5GHz

DETAILS

- Price: £82
- Manufacturer: AMD
- Website: goo.gl/n7LTuo
- Requirements: AM3+ motherboard, DDR3 RAM, 450W minimum PSU

Some weeks ago, we looked at a collection of Intel i5 and i7 processors, so now it's the turn of AMD's FX-range.

AMD is known for producing cost-effective alternatives to Intel's processors, but in recent years AMD has dropped the ball when it comes to manufacturing the latest processor technology.

We have six of the company's higher-end FX processors to look at this week. Which are worth considering for your AMD system?

The FX range of AMD's processors were originally designed to be the affordable Intel i5 and i7 killers. Bred for high-end computing tasks, the range featured high clock speeds and an equally impressive number of cores.

The AMD FX-6300 falls into the middle of the range, but since its release in October 2012, the CPU has dropped in price significantly, making it one of the cheapest of the FX family.

This 3.5GHz AM3+ socket CPU, with a turbo clock speed of 4.1GHz, boasts six cores, six threads, 6MB of L2 cache (1MB per core), 8MB of L3 cache (1.33MB per core) and a TDP of 95W. It follows the Piledriver microarchitecture, based on the Vishera processor core and a 32nm manufacturing process.

The processor is unlocked, as with all of the FX range and, on average, the overclock speed hits around the 4.7GHz range with a decent air cooler or around 4.8/9GHz with a liquid CPU cooler. We did manage to hit an okay 4.8GHz using an Arctic Liquid Freezer 240, and we felt we could have gone a little higher, but we didn't due to this being the only chip we had for testing.

Ideally, the FX-6300 makes a great budget gaming CPU, although in all fairness it's not as fast a processor as Intel's higher-



▲ The AMD FX-6300 manages to combine decent performance with a low cost

► It's the cheapest of the FX-range at present

end i5 series. However, at just £85, you could easily put the savings into buying a higher-end graphics card. Likewise, the multi-core tasks make for an excellent video and photo editing system, and for those who avoid gaming and focus instead on day-to-day computing tasks, the FX-6300 certainly won't let you down.

As for benchmarks, we ran the FX-6300 at its stock speeds (3.5/4.1GHz), and with Cinebench R15 single-core, the FX-6300 managed a reasonable score of 95, and 458 for the multi-core test. The PassMark version 8.0 test came back with an overall score of 6,385 and a single-core score of 1411.

The scores are quite reasonable, placing the AMD FX-6300 just below the Intel i5-6400. While Intel still has the edge over AMD, it's worth keeping in mind that the



aforementioned rival to the FX-6300, the i5-6400, costs around £150. So that extra £65 can be spent on some other component while you only suffer a slight drop in terms of performance. If you were to push the overclock, even up to a base of 4GHz, then you'll obviously be looking at a faster system and better frame-rates or quicker decoding.

The AMD FX-6300 processor is an amazingly versatile and nicely priced CPU. It may not have the edge on some of the Intel models, especially the newer sixth-generation CPUs, but it can hold its own without breaking the bank.

AMD FX-4350 4.2GHz

DETAILS

- Price: £90
- Manufacturer: AMD
- Website: goo.gl/QRxEZB
- Requirements: AM3+ motherboard, DDR3 RAM, 500W minimum PSU

The AMD FX-4350 is a slightly newer processor than the FX-6300. Released in April 2013, this Piledriver microarchitecture, Vishera core is a mid-class CPU using a 32nm manufacturing process.

This 4.2GHz AM3+ processor, with a turbo clock speed of 4.3GHz, features four cores, four threads, 4MB L2 cache and an 8MB L3 cache. The TDP is surprisingly high at 125W, but that isn't too much of a problem.

Overclocking the FX-4350 has in the past come up with some pretty impressive numbers. The average air-cooled overclock speed is around 5GHz, with a liquid cooled overclock of 5.37GHz. We managed to push it to 5.01GHz with our Arctic Liquid Freezer 240, which we

were quite impressed with. No matter how many cores or super-low manufacturing processes are involved, in most cases, gigahertz rule.

It's a surprisingly capable CPU, and although it lacks the extra cores that the FX-6300 has, it still does a really good job of being a budget gaming platform. What's more, the FX-4350 only costs £5 more than the FX-6300, at £90. So in instances where more gigahertz count and for better single-core performance, the FX-4350 is a better buy than the FX-6300. However, if you require multi-core performance on a budget, the FX-6300 is where the smart money is at present.



▲ Those after multi-core performance will need to move on, though

**“ It's a good processor
and one that'll keep up with
most users ”**

As for benchmarks, the FX-4350 did reasonably well. The multi-core performance was always going to be less

than the FX-6300 from the same price range, but its single-core scores were better. The Cinebench R15 single-core score was a good 97, while the multi-core score of 392 could be better. The PassMark version 8 overall score was a reasonable 5,298 and the single-core score was 1,522. As before, we ran the benchmarks using the stock clock speeds of the processor.

Essentially, the FX-4350 is a faster and more power hungry version of the FX-4300, with it being at least 400MHz quicker. The slight refresh didn't radically improve things, unfortunately, so the

FX-4350's launch didn't have the impact AMD was hoping for. That said, it's a good processor and one that'll keep up with most users.

Higher-end gamers and those who demand better multi-core performance, for tasks such as virtualisation and video editing, will need to look elsewhere. For the rest of us, though, £90 is a good price for a processor we can safely clock up to 5GHz.



▲ The AMD FX-4350 has some decent single-core performance scores



AMD FX Processors

AMD FX-8320E 3.2GHz Black Edition

DETAILS

- Price: £110
- Manufacturer: AMD
- Website: goo.gl/AUU6L8
- Requirements: AM3+ motherboard, DDR3 RAM, 450W minimum PSU

AMD's Bulldozer architecture had limited success when it was first launched, mainly due to the lack of support it had at that time and some problems with performance. This gave Intel access to the processor slipstream, so its lead was increased significantly.

The architecture has matured somewhat since then. The Piledriver microarchitecture we've looked at so far has proved to be a worthy and cost-effective counterpart to Intel's more expensive i-platform.

The FX-8320E is a more modern release from September 2014, with a 3.2GHz base clock speed, 4GHz turbo clock speed and an impressive eight cores and eight threads. There's 8MB of L2 cache (1MB per core) and 8MB of L3 cache (again, 1MB per core) and a more acceptable TDP of 95W.

The 'E' addition to the end of the processor number, in case you're wondering, denotes a lesser TDP than the standard FX-8320, which has a TDP of 125W. The Black Edition label is always something that tends to confuse people, since it's something left behind from older AMD CPUs. Basically, the Black Edition used to mean a processor that was



▲ AMD's FX-8320E with an efficient TDP of 95W

unlocked and could therefore be overclocked. Since the FX processors are already unlocked, the Black Edition label is really a little

4.7GHz, but pushing it slightly more revealed some instability.

As for performance, the FX-8320E is certainly no slouch, especially when it



▲ It's a worthwhile eight-core processor, with some good overclocking

gigahertz, and it doesn't consume much power – using the base clock speed, obviously.

Needless to say, the FX-8320E is a capable CPU, which can happily deliver good gaming performance, as well as higher-end computing tasks and everyday duties. While it may not beat the higher-end Intel i5 or i7 CPUs, for around £110, it's a really good processor and for that price it'll beat a similar-costing Intel-based system in performance.

“ The FX-8320E is a processor that successfully ticks a number of boxes ”

redundant. However, some people regard the Black Edition, even in the FX line-up, as being able to get higher overclock speeds than non-Black Edition CPUs.

On the topic of overclocking, the average air-cooled clock speed tends to be around 4.5GHz, with a liquid-cooled clock speed topping 4.8GHz. Using our Arctic Liquid Freezer 240, we did manage to get the processor up to a stable

comes to multi-core performance. The Cinebench R15 single-core test score was 93, while the multi-core test score was an impressive 586. Likewise, the PassMark version 8 overall score was an equally good 7,966 while the single-core score came in at 1,361.

The FX-8320E is a processor that successfully ticks a number of boxes. It's reasonably cheap, it has plenty of overclocking support with a stable high number of



AMD FX-9370 4.4GHz

DETAILS

- Price: £180
- Manufacturer: AMD
- Website: goo.gl/MHBnO6
- Requirements: AM3+ motherboard, DDR3 RAM, 850W minimum PSU

The FX-9370 marked the return of AMD to the high-end CPU market in June 2013. This

Piledriver- and Vishera-based chip has a 4.4GHz base clock, a 4.7GHz turbo clock speed, and it uses the same 32nm manufacturing processes as the previous models in the guide, but in this instance AMD sought to market these CPUs as extreme overclocking models, bundling a liquid cooler with some releases.

It's an eight-core, eight-thread CPU with 8MB of L2 cache (1MB per core) and 8MB of L3 cache (with, again, 1MB per core). The faster processor speeds demand more power, so this AMD model has a higher TPD of 220W, compared to the E-flavoured models that have a lower 95W.

Overclocking is the key to this processor's success, with an air-cooled average overclock speed of around 4.7GHz and a fantastic water-cooled overclock speed of around 5.2GHz. We didn't take ours all the way up to 5.2GHz, though. Instead, we settled for a perfectly stable 5.1GHz and enjoyed the benefits of showing off the numbers to anyone who was even remotely interested.

Naturally, the higher TDP and overclocking will require a suitable motherboard and cooling; AMD even



▲ *The AMD FX-9370 is a high-end, performance CPU*

► *It's also one of the most power-hungry desktop CPUs available*

recommend a liquid cooler for the stock speeds of the FX-9370 and its twin, the FX-9590, which was released around the same time. This, of course, increases the cost of a system built around this processor, and with the processor itself costing around £180, the overall cost can rise quite quickly.

Our benchmarks produced some interesting numbers, though, as you'd expect from a higher-end CPU. The Cinebench R15 single-core score was an excellent 98, while the multi-core score was an equally impressive 702. Likewise, the PassMark version 8 overall score was 9,669, with the single-core score being 1,698.

They're the highest numbers in the guide so far,

and they're better than Intel's i7-5950HQ CPU by a few points. As you would expect, the FX-9370 makes for an excellent gaming platform as well as being more than capable of higher-end computing tasks such as virtualisation, video and photo editing and most other duties you can think of. The single-core performance is good too, but in all honesty it's probably overkill for those who use their PCs for everyday tasks.

However, despite the performance improvement, the FX-9370 still lags behind the Intel similar priced model, the i5-6600K. Overall, the i5-6600K performs slightly better and has a much lower TDP of just 91W, and there's only around £5 or so difference in price – the



i5-6600K being the more expensive processor.

Having said that, the AMD FX-9370 is a good processor and one that should keep you happy for a while.



AMD FX Processors

AMD FX-8370E Black Edition

DETAILS

- Price: £164
- Manufacturer: AMD
- Website: goo.gl/VP1BZ5
- Requirements: AM3+ motherboard, DDR3 RAM, 450W minimum PSU

AMD has an odd numbering system going on. You would expect a more recent processor than the FX-9370 to have a higher number, but in fact it's lower. The FX-8370E came out in September 2014, over a year after the FX-9370, and it's not like it's based on another FX-8370 from an older date, as that model came out at the same time.

Anyway, the FX-8370E has a 3.3GHz base clock speed, 4.3GHz turbo, and is based on Piledriver microarchitecture. This Vishera processor has eight cores and eight threads. As with most of the higher-numbered AMD CPUs, this model comes with 8MB of L2 and L3 cache – 1MB for each core.

The 'E' (Efficiency) and Black Edition branding is something we've already come across with the FX-8320E, and again it means that the FX-8370E has a lower TDP of 95W than its sibling FX-8370, which has a TDP of 125W. This version also has a lower base clock speed compared to the non-E version, which offers 4GHz base – both have the same turbo clock speeds, though.

The average overclock speeds using an air cooler are around 4.75GHz, with the average liquid-cooled overclock speeds hitting 5GHz. With our Arctic Liquid Freezer 240, we didn't get as high as

▲ *The AMD FX-8370E is a worthy power-efficient CPU*

► *With good performance levels, it makes for a decent desktop processor*

5GHz. Instead, we stuck with a stable 4.9GHz; there were instability problems when we touched on the 5GHz speeds. Still, 4.9GHz isn't too shabby.

Our benchmark tests were adequate enough for most users and to be expected for a processor of this kind. The Cinebench R15 single-core score was a more than reasonable 98 (equal to that of the FX-9370), with a multi-core score of 620. The PassMark version 8 overall score was an equally good 8,290, with a single-core score of 1,530. This puts this processor in second place behind the higher-end FX-9370 – not bad for a more efficient CPU.

Although it's a capable CPU, the price of around

£164 is a little steep for the level of performance offered. Of course, the E-efficiency part is something well worth considering, especially since most AMD FX processors tend to be a little power hungry, even compared to their Intel counterparts. The main problem, though, is that the Piledriver microarchitecture hasn't really added anything new since it appeared in mid-2012, and the FX-8370E is a prime example of AMD just tuning the processor rather than stretching the manufacturing process to effectively compete with Intel.

Positively speaking, though, the AMD FX-8370E ticks a number of boxes for the vast majority of users. It'll remain reasonably high in



performance ranks for a while yet, and with a good GPU paired with it, it'll still keep avid gamers happy.



AMD FX-9590 4.7GHz

DETAILS

- Price: £218
- Manufacturer: AMD
- Website: goo.gl/azzMoS
- Requirements: AM3+ motherboard, DDR3 RAM, 850W minimum PSU

The top-end FX processor from the Piledrive microarchitecture range is the FX-9590. Although there's no advancement in the manufacturing process (it's still at 32nm with the same Vishera core), AMD has upped the clock frequencies significantly in the hope of attracting performance enthusiasts to its FX-range.

The FX-9590 has a base clock speed of 4.7GHz, with a turbo clock speed of 5GHz. It has eight cores, eight threads and 8MB L2 and L3 cache. The TDP is the same 220W as the FX-9370 we've looked at, as are nearly every other aspect of the processor – minus the higher clock speeds, of course.

Sadly, in terms of overclocking, the FX-9590 doesn't fare quite as well as the other FX processors we've looked at. The average air cooled overclock speed appears to be 5.07GHz, while the liquid-cooled overclocked speed was only slightly higher at 5.08GHz. We didn't get anywhere near those speeds, though, even a slight overclock resulted in an unstable system. So we left the CPU running with its default 4.7/5GHz speeds, which are still quite impressive.

Benchmarking the world's first 5GHz CPU was always going to be interesting. The



▲ The AMD FX-9590 is the fastest of the FX-line

► But it's extraordinarily power hungry, and there's not much room for overclocking its already high frequencies

single-core Cinebench R15 score came back at 110, and the multi-core score was an equally huge 735. Meanwhile, the PassMark version 8 overall score of 10,515 and single-core score of 1,730 were quite jaw-dropping, so the highest we have in the entire guide.

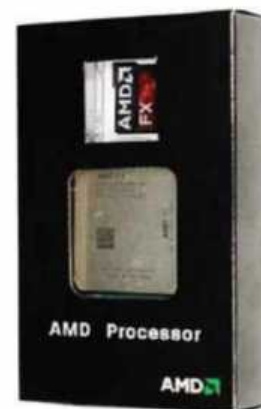
Those scores aren't too far off that of the Intel i7-6700K, a processor that cost £60 more at £280. On the negative side, though, the i7-6700K is clocked at 4GHz and is only a quad-core compared to the FX-9590's eight cores. Overall, the i7-6700K is a better performing processor, but AMD isn't too far behind even with its older technology.

Power consumption is high, as it was with the FX-9370, but those who are prepared for

such a CPU will undoubtedly have something in place to cater for such a power-hungry CPU and other components.

It's a performance CPU, so it's not something that the average consumer would consider. But if we're being honest, it doesn't make a huge amount of sense to the performance enthusiast. As we've already pointed out, the i7-6700K is a better performer, and it doesn't require anywhere near as much power – just 91W. Also, there's very little room for overclocking with the FX-9590, unless you have access to something like liquid nitrogen and can tune it up to 6GHz or some other semi-mythical clock speed.

The AMD FX-9590 costs in the region of £218 and is



the more expensive of the FX processor line-up. But who'll go for it over an equally priced Intel CPU is debatable.





Component Watch

Getting a colour laser printer is more affordable than ever...

Colour laser printers were once the stuff of fantasies alone, but now they're almost affordable for use at home or for your small business. Admittedly, if you don't do a lot of printing, they might not be much use, but if you want to print even one high-quality report or presentation in colour, then it might be just as cost-effective to buy the printer yourself as to get it done professionally. Here's what you can expect to pay.

Deal 1: Ricoh Aficio SP C250DNW
RRP: £94.98 / Deal Price: £79.98

This wireless-enabled laser printer from Ricoh is one of the cheapest colour lasers on the market, capable of 20ppm and 2400 x 600dpi printing. It has an automatic double-sided printing feature as well as USB and Ethernet compatibility, and the first-page print time is a speedy 14 seconds. 1,000-page toner cartridges come included in the price. There's even a print-and-scan mobile app you can download. An ideal place to start.

Where to get it: Ebuyer – bit.ly/1POCKkn

Deal 2: OKI C301dn
RRP: £119.99 / Deal Price: £94.98

Only a little more expensive than Ricoh's printer, the Oki C301dn has a free three-year warranty and wireless 'pocket router' adaptor to add wireless connectivity – though it can be used on other devices if you like! Printing is 22ppm in mono and 20ppm in colour, with a 1200 x 600dpi resolution and auto-duplex feature. It's compatible with airprint and has a first page print time of a super-speedy 8.5 seconds. The lower resolution does make it questionable whether it's worth £15 extra. We guess it depends on whether you've got use for that pocket router!

Where to get it: Ebuyer – bit.ly/29wB9ka



Deal 3: Canon i-SENSYS LBP7010C
RRP: £175.97 / Deal Price: £94.99

Canon's name is virtually synonymous with printing, so you might expect its laser printer to be one of the best around. For some reason, though, you don't get quite as much for your money when it comes to this colour laser. The print speed is just 16ppm, and although the resolution is a high 2400 x 600dpi, there's no built-in networking, and the first page takes 14 seconds to print. There's also no mention of duplex capabilities. Still, you might want to stick with a reliable name, and at least there's no danger of Canon disappearing from the market any time soon!

Where to get it: Laptops Direct – bit.ly/29qnj35



Deal 4: HP CP1025
RRP: £124.97 / Deal Price: £98.98

Another big-name printer manufacturer, HP's cheapest colour laserjet is incredibly slow when it comes to colour (just 4ppm!), but it manages a speedier 16ppm in mono. First page printing is a chugging 15.5 seconds, and the manufacturer warranty is only a year long. Combined with the 600 x 600dpi, it's hard to recommend, given that it isn't even competitively priced. If you like to stick with HP, however, this is the cheapest model it offers.

Where to get it: Laptops Direct – bit.ly/29Bs8HS



Deal 5: Dell C1760NW
RRP: £131.98 / Deal Price: £99.99

The last from the big-name printer manufacturers, Dell's colour laser is also pretty slow, printing at 15ppm in mono and 12ppm in colour, with 600 x 600dpi, but at least this one has networking and mobile device support. It does have high specs and Dell's hardware is always well made, but ultimately it's still far behind even the cheaper models on the market. You have to decide whether it's worth it!

Where to get it: Ebuyer – bit.ly/29k4AlZ





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In this new monthly feature, Micro Mart will be rounding up the podcasts we think you should probably be listening to on a particular topic. We're eager to share our favourites, and we want to know yours, so don't forget to point us in the direction of any podcasts you think we've missed – especially if you're recording your own!

Richard Herring's Leicester Square Theatre Podcast

76

Regular features include 'emergency questions' (such as 'Have you ever seen a ghost?') and 'Citation needed', where he challenges a guest to clear up something on their Wikipedia page that doesn't have an official source.

There are over 100 episodes to download, with big names such as Stephen Fry, Eddie Izzard and David Mitchell rubbing shoulders with the rising stars of alternative comedy. Always unpredictable, the interviews have a varied tone but are never anything less than hilarious. And if you're more of a visual person, most recent episodes have also been filmed and put on YouTube so you can enjoy them there as well.

URL: www.comedy.co.uk/podcasts/richard_herring_1st_podcast

Start With: RHLSTP #68: Robert Webb, which sees the *Peep Show* star in a fun and candid mood.

Pappy's Flatshare Slamdown & Do The Right Thing

Lumped together in this list because they're often recorded as a two-hander, these podcasts from Fuzz Productions are fully formed panel shows fronted by sketch act Pappy's and stand-up Danielle Ward respectively.

Pappy's Flatshare Slamdown sees two teams competing to win the right to avoid performing a basic household chore in the (presumably) fictional Pappy's flatshare, winning points by answering questions under increasingly bonkers restrictions. The often well-lubricated guests mean the whole thing has a superbly anarchic feel, but perhaps the best feature is the increasingly misnamed quickfire round.

URL: www.comedy.co.uk/podcasts/flatshare_slamdown

Start With: Festive Special 2011, which is topped off with the incredible pun-fest 12 Days of Quizmas

Similarly hilarious, *Do The Right Thing* is a panel show where the panel of guests have to solve dilemmas (both real and imagined) in the funniest way possible. The team captains are angry vegan Michael Legge and queen of Catholic oversharing Margaret Cabourn-Smith. It's like a Radio 4 show produced by drunks, and inevitably brilliant. The highlight is the final section, 'Do The Wrong Thing', which asks guests to do the least correct thing in any given situation.

URL: www.comedy.co.uk/podcasts/dotherightthing

Start With: Series 4, episode 3, in which comedy duo Peacock & Gamble go head-to-head on opposing teams

The Adam Buxton Podcast

A veteran podcaster whose XFM and 6music outings kicked off a wave of imitators, the beardier half of duo Adam and Joe has recently returned to the form for a series of interview podcasts, where he combines his love of cultural minutiae with his talent for anecdotal comedy – his first conversation with broadcaster Louis Theroux grapples brilliantly with the question of whether it's okay to take food from a buffet.

Buxton's casual style (he often records the intros while walking his dog) is a welcome antidote to the dominant personalities that often crowd out the guests on interview podcasts. What really makes these episodes hold together as packages is the care put into them, though; Buxton peppers his-homemade jingles throughout each episode and each one is a catchy delight. Comedian-fronted interview podcasts are all too common, so you know it has to be special for us to recommend it this much.

URL: adam-buxton.co.uk

Start With: Episode 4: Jon Ronson, in which both men get to grips with their feeling of being marginal and Adam debuts a new (unofficial) Bond theme.

Comedian's Comedian

A comedy podcast about the craft of comedy might sound niche, but you don't have to be an aspiring stand-up to enjoy hearing how these talents got started and what makes them tick. Stu Goldsmith spends an hour (or sometimes two) finding out why your favourite comedians do what they do and, perhaps more interestingly, how they do it – all in the search of the answer to one big question: does it make them happy?

Released weekly, most people will probably find it more interesting to listen to episodes featuring comedians they know, but with over 150 episodes in the archive, there's a good chance your favourites have featured before. Especially if you've ever wondered about getting into stand-up yourself, there's no better guide to the mechanics of the comedy industry than the words of the people inside it.

URL: www.comedianscomedian.com

Start With: #164 – Jimmy Carr, a two-part chat where one of the country's biggest stand-ups spills his secrets.

Comedians Telling Stuff

Comedian Sophie Hagen does the one thing few podcasters know how to: asks her questions and gets out of the way. Using her comedy connections, Hagen invites a group of six different comedians every season to interpret the same six topics: Firsts, Worst, When I Knew, Hecklers, Love & Sex and Lessons Learned. Their responses are cut together to make an episode themed on that topic, revealing the fun and not-so-fun aspects of life as a comedian.

One of Hagen's strengths is in mixing up big-name stars with rising talent, making it a great way to discover stand-ups you might not otherwise have been exposed to. The episodes are short and, unlike many interview podcasts, they're cut into digestible chunks, so they're ideal if you're looking to fill a short amount of time. Not everyone has two hours to plough into a single episode every week, and Hagen's economy is a welcome attribute in a world where some podcasts seem to see any editing as an affront to all decency.

URL: www.comediantellingstuff.com

Start With: Edinburgh Special 2015, a bumper compilation episode where 24 comedians talk about their love-hate relationship with the Edinburgh festival.

That's all for the first instalment of our Podcast Round-up. Feel free to let us know if there's anything important we missed, and we'll try to feature it next time around! **mm**





The Complete History of Home Computing

Part 1

We look back at how we got where we are today

In this new monthly feature, Micro Mart aims to track the complete history (yep, complete) of home computing, from its first faltering beginnings to the phenomenon it's become today. We start, of course, at the beginning...

The Beginning

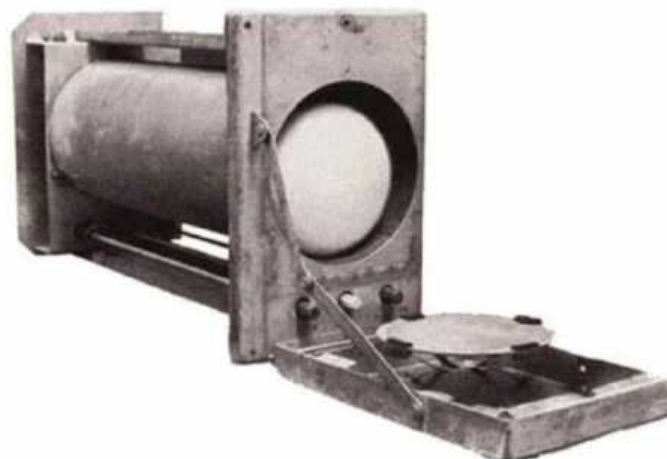
Of course, it's debatable where the beginning of home computing actually is. You could go all the way back to the abacus, but there's not a lot to mine there in terms of how it relates to modern computing. Likewise, Charles Babbage's difference engine: the mechanical calculator is important in terms of automating computation, but it doesn't necessarily relate to modern home computing in any particular way.

Some might look to the earliest adders, which provided proof of concept for applying Boolean logic in circuitry, which provides a direct through-line to modern processors. One of the earliest, if not the first adder ever was developed by Bell Laboratories scientist George Stibitz, who created the 'Model K' adder, so named because he built it on his kitchen table. That was in 1937, and it led to the construction of the 'Model I Complex Calculator' in 1939. This device was built out of 450 relays, with a keyboard and teletype machine attached, making it, at least superficially, one of the first recognisable personal computers.

Despite that, it was not electronic, nor digital, nor programmable. Bell Labs did not pursue it as a commercial design, though it did develop further versions based on it.

At the same time, the Model I Complex Calculator was being built, German engineer Konrad Zuse was putting his own relay-based calculator together. That one was known as the Z2. In 1941, Zuse finished the Z3, which was mostly impressive for being built in virtual scientific isolation from the rest of the world. The Z3 used 2,300 relays and could perform floating point binary arithmetic with a 22-bit word length, and it was the first program-controlled, electromagnetic digital computer. It was used to make aerodynamic calculations, before being destroyed in a bombing raid in 1943.

However, the early design that probably matters most for home computing is the Atanasoff-Berry Computer (ABC), which was completed in 1942. Constructed at Iowa State College by Professor John Vincent Atanasoff and his student, Clifford Berry, the ABC



▲ Williams Kilburn Tube

was subject to a patent dispute related to the invention of the computer. Had the dispute gone another way, several key concepts might have been restricted to their patent-holder. As it was, the ABC proved that Atanasoff was the originator of many computing concepts but that they were non patentable.

Of course, no history of home computing could pass without mentioning Bletchley Park either. Designed by Tommy Flowers, the Colossus computer was developed in 1944 to crack Nazi ciphers, and it's believed to be responsible for significantly shortening the war – not to mention helping to kickstart the UK's computing industry by showing how important and valuable computing research was.

General purpose computers were still uncommon, however. In 1945, Konrad Zuse took a step towards creating one when he developed 'Plankalkül' (Plan Calculus), which is acknowledged as the first programming language. This created a theoretical way to solve general problems; all it needed was an implementation.

The Post-War Years

The first ever electrical computer started construction during the war but was unveiled in 1946. ENIAC was built by John Mauchly and J. Presper Eckert at the Moore School of Electrical Engineering and was over 1,000 times faster than any previous computer. In the ten years it was operational, it's believed to have performed more calculations than all of humanity had in recorded history. As well as being an ancestor of all modern electronic computers, ENIAC was also the other half of the patent lawsuit that cited the ABC computer, so in that sense it contributed in both a technical and legal way.

Until this point, computers used tape and paper output to deliver and store their results. In 1947, at Manchester University, Freddie Williams and Tom Kilburn developed the Williams-Kilburn tube. This was essentially the first piece of high-speed electronic memory. It used a cathode ray tube to store bits and dots on a screen, refreshing the information through a metal plate that detected a change in the electrical charge.

The following year, a Williams-Kilburn tube was used in the SSEM (Small-Scale Experimental Machine), which was the first computer to run a computer program. It was 17 instructions long and ran on 21st June, 1948, testing the first electronic random access memory storage.

In 1949, IBM signalled a landmark switch from mechanical computing to electronics. IBM executive Thomas Watson Jr predicted that it would be using purely electronic circuitry



▲ Colossus

within ten years, coining the slogan 'Solid State by '58' to drive their engineers to focus on transistors rather than vacuum tubes and relays.

At the turn of the 1950s, the US hobbyist magazine Radio Electronics published what might be regarded as the first ever home computer: the Simon 1. This relay computer cost about \$600 to build, but was just four cubic feet in size and could, in theory, be built and used by an amateur using the provided plans – as long as they had the money.

Around the same time, the Festival of Britain demonstrated what is probably the first computer game. The computer company Ferranti built a machine that allowed members of the public to play a version of NIM, a game where you remove matches in an attempt to be the last person who picks one up. If that doesn't count, then Britain still gets the point: in 1952, Cambridge University student Alexander Douglas made a computer play noughts and crosses on a 35 x 15 dot cathode ray tube, which moved entered using a rotary telephone dial. Gaming, of course, remains a huge driver for both the purchase and development of home computing.

In 1953, Manchester University developed the first fully transistorised computer, paving the way for the miniaturisation that would eventually allow electronic computers into a normal home. In 1956, MIT began to experiment with direct keyboard input, which started technology on the path away from punch cards and paper tape.

Similarly, 1956 saw the first computer that was designed for a single user – arguably the first personal computer. Known as the Librascope LGP-30, it was developed at Caltech and used for science and engineering applications. Although small by the standard of room-sized computers used at the time, it actually resembled a large desk, with space for a user to sit at while the computer performed its operations.

The 1960s & Beyond

Throughout the late 1950s and early 1960s, computers got successively smaller, and programming languages became more commonly used. COBOL was developed and, despite fears that the language had no future, it remains in wide use even today.

Time-sharing also became possible, allowing multiple people to log into a single computer over the phone lines, sending their commands using terminals. Multi-user timesharing groups had many features common in modern home computing, such as email and chat functions.

In 1962, IBM developed the IBM 1311: the first disk drive with interchangeable storage. Each disk pack had six disks, weighed over 4kg, and rotated at 1,500rpm. The predecessor of the modern disk drive.

The same year, the Atlas computer came online. A joint project between Manchester University, Ferranti and Plessey, it was the fastest computer in the world when it was switched on and the first to use virtual memory. The Atlas Supervisor software that controlled it is also considered the first operating system. You don't need us to tell you how both virtual memory and operating systems are key components of home computing!

In 1963, ASCII was developed. The American Standard Code for Information Interchange allowed machines from different manufacturers to communicate data to one another, with each of 128 binary sequences representing a character or punctuation. ASCII is still in use on modern computers today, and so key that it's almost hard to imagine a time before it!

By 1968 IBM had refined its disk storage systems to the point where it could release the 'Minnow', a read-only floppy disk drive,



▲ IBM 1311 Disk Pack

which was famed for its small size. Each 8" disk could hold 80 kilobytes of data.

Computer networks had existed before 1969, but when it came online that year, ARPAnet was the first to connect lots of different types of computer together. ARPA and its competitors/cousins would go on to form the basis of today's internet.

Perhaps the most significant development of the 1960s, though, came right at the end with the development of Unix. Developed by AT&T Bell Labs programmers Kenneth Thompson and Dennis Ritchie, the Unix operating system was multi-user and multi-tasking, and continues to run huge chunks of the world's computing infrastructure close to 50 years later.

The following year also saw the development of the programming language, Pascal. Its creator, Niklaus Wirth, wanted to make a programming language that could be used for both commercial and scientific applications as well as a teaching aid to introduce students to programming. Although no longer one of the most important programming languages around, it remains a convenient teaching tool; if you've done any amount of programming, you've probably tried it out. Two years later, in 1972, Dennis Ritchie and his team wrote the programming language C and then rewrote all of Unix's source code into the language.

1972 also saw the release of *Pong*, the first mass-market video game, and at the same time the release of the HP 9820A, HP's third electronic calculator and the first fully algebraic one. It used its own programming language and is generally considered the first truly personal computer.

In 1975, home computing was brought ever closer by the development of the MOS 6502 processor. This was the first ever low-cost microprocessor and was so cheap (just \$25) that it was initially believed to be a hoax. The processor would end up powering the Apple II, the Commodore PET and even the Nintendo Entertainment System, and perhaps represents the true birth of home computing.

That's why, for this instalment at least, we'll leave things there. This month we've tracked the development of computers from the early, mechanised examples through to the development of the technologies that would form the basis of home computing. In 1976, Steve Jobs and Steve Wozniak would complete the Apple-1, kicking off home computing in earnest. And that's where we'll start next month! **mm**

Remembering... Ubuntu 4.10

We recall the first version of a great Linux distro

October 2004 promised to be an interesting month in the Linux community, as Canonical was releasing its very first distro.

The September before had seen a collection of adverts announcing the release, and the community's interest was piqued. Here, it seemed, was a distro that brought us the power of Debian's package manager, the user-friendliness of Mandrake and the lightweight speed and responsiveness that Slackware boasted.

We also liked the marketing around the unfamiliar name, Ubuntu, which we learned was an African word meaning humanity to others. The code name, Warty Warthog, sparked some interest too, because it indicated a sense of humour.

The CD was available from the covers of a number of magazines, or you could email Canonical, and it would send you the CD pack. The pack contained the disc itself, along with a brief leaflet highlighting the features of this new distro. There was even a small poster included, with some packs showing the familiar brown background and a group of people holding hands in a circle.

The disc also features a short video with Nelson Mandela, who explained the meaning of Ubuntu and how it was something that described an open society. Once installed, that video also appeared in the Videos folder.

All of the above made for something different, which is what stirred the

community into accepting Ubuntu despite the few flaws that the distro had in those early days. As the distro matured, so did its look, changing the default wallpaper, fonts and finally the desktop environment from Gnome to Unity with 2011's Ubuntu 11.04 (the Natty Narwhal).

Other controversial additions to the OS followed, but the distro has managed to retain its userbase well enough to make it one of the most popular Linux distributions available.

Its History

Ubuntu was developed by a team of open-source engineers sponsored by South African entrepreneur Mark Shuttleworth's company Canonical.

The emphasis for the new distribution had several points that it needed to hit before it was released to the public. For one (and the most important aspect of the distro), it had to be user friendly. It had to be able to bridge the gap between a desktop Linux and a server-based version of the OS, so Canonical could focus on providing services rather than concentrating all of its efforts on the OS itself. A live desktop was required, to allow users to experience the OS before committing to an installation, and it had to work with the vast majority of available hardware.

The desktop was clean, simple and bright, but it also packed in a fair amount of features. With Gnome 2.8, Firefox 0.9, Evolution 2.0 and OpenOffice 1.1.2, Python

Did You Know?

- The Computer Janitor tool, which was removed in version 11.10, frequently had the habit of wiping the system.
- There are a reported 40 million Ubuntu users worldwide.
- Since version 4.10, Ubuntu has become the world's most popular cloud OS.
- Version 5.04 introduced USB installation support.

2.3, Gimp 2.02, Nautilus 2.8 and using Kernel 2.6.7, Ubuntu 4.10 caught on and quickly became a popular choice for both beginners and more advanced users – enough to have Canonical add the “third most popular OS in the world” tagline to later installations.

The decision to send a free-post CD to those who emailed in was Shuttleworth's idea and one that is still applauded to this day.

4.10 made way for 5.04 in April the following year, with 5.10 the following October. The naming convention stuck and this year we'll see the launch of 16.10 Yakkety Yak.

The Good

A simple, fast and clean-looking Linux that was ideal for beginners.

The Bad

It wasn't brilliantly stable and hardware detection had problems. [mm](#)



▲ The first Ubuntu login screen, where many Linux users started their journey



▲ The original packaging, with free CDs



▲ The three models formed the Ubuntu circle logo, signifying unity and humanity to others

RETRO ROUND-UP

From the infeasible through the illogical to the magical and the downright painful, David Edwards continues his never-ending quest to promote the best new software for 80s machines, and warn us off the rest...

Welcome

Regular readers may remember that, in the earlier days of this column, I advocated investing in physical cassettes and disks for retro formats. As time has worn on, however, the number of publishers producing physical versions has waned, and the column has drifted more towards new games only available as emulator files.

Although there's nothing wrong with that, this month I've therefore decided to take the column back to its roots and focus on some newish games from last year's famous faces – among them CEZ, Psytronik and RetroWorks – who continue to supply their games not only as free downloads but also as collectible cassettes or disks. So join me as I see what creative expressions can be picked up for a fiver plus postage online...

Illogical

(Spectrum 128K/ZX Vega, CEZ Games Studio, £4/Free, tinyurl.com/jqrrh5q)

Regular readers will recall my favourite retro game of 2015 was *Pixel Quest*, a puzzle game where you built up a picture on a grid by reference to a series of numbers on its horizontal and vertical axes. Apparently, these 'nonogram' games have

existed for years, and I'm in the minority having not experienced the joys of such pixel-plotting before.

Illogical is the same type of game. You get a blank grid, typically 16 x 16 characters, and must look at the numbers to determine whether you can safely 'mark' individual rows and columns in compliance with what they say, but without disturbing the combination required by the opposite axis. The grids begin easily enough, with columns simply stating 16, meaning each square in it should be 'marked', and row combinations such as 2128 (XX.X.XX.XXXXXXX). The grids do, however, start to toughen up after level four.

So far, so identical to *Pixel Quest*. Indeed, there's really only one big difference between the two games. The difference is what happens when you make a mistake, either carelessly or recklessly. *Illogical*'s grids have a 30-minute time limit. That seems very generous until you realise that 'marking' a single square wrongly incurs a five-minute time penalty. The implication of this is that you can afford to make a maximum of roughly five mistakes per grid before your time will be up. *Pixel Quest* has no such limitation; each grid took you as long as it took and, on successful completion, a brand new one was presented.

Illogical

Graphics 50%

Sound 85%

Playability 90%

Value For Money 80%

Overall 76%

What's quite interesting about a 'timed' version of *Pixel Quest* is that being thwarted by your own carelessness does actually mean you don't find you've lost several hours playing it non-stop. Being thrown back to the title page and having to start again breaks your intense concentration and results in *Illogical* being slightly less addictive. It is however, more challenging.

Overall, then, despite having been (mostly) done before, there is just enough of a change to the nonogram formula that this should be added to your games collection. Competently programmed with a superb loader and in-game music, it will also likely make this year's favourites too.

Available to buy on limited edition cassette from Computer Emuzone (computeremuzone.com), preloaded on



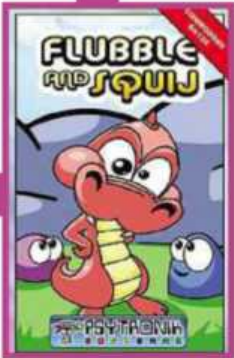
▲ This month's games all feature cute cover art. *Illogical* is no exception



▲ Create a picture from the combinations on the axes before time runs out



▲ It features famous Speccy characters such as, um, Phantomas



▲ The box art shows your dragon ready for action



▲ You must tail-spin through the platforms



▲ You will become dizzy after each tail-spin

the ZX Vega or available to download for free from Everygamegoing at tinyurl.com/jqrrh5q.

Flubble And Squij (Psytronik, Commodore 64, £4.99, tinyurl.com/zmtwdgh)

Flubble And Squij is a tricky platformer that is currently available from Psytronik for the Commodore 64. It comes in two versions, which offer similar game mechanics but very different sprites. For the sake of ease, this review is of the 'Remix' version.

You play Flubble, a dragon-like character, controlled with the joystick. Pushing up will jump, and pulling down will teleport – whenever you position him over a pipeline. As is the usual fare of platformers, the platforms are patrolled by aliens intent on colliding with you and taking away one of your precious lives. To combat them, you can press the fire button, which puts Flubble into a 'tail-spin' and causes him to despatch aliens he collides with.

The good news about the tail-spin is that it's remarkably effective. The bad news is that it's a very odd effect to behold; your dragon spins through 360 degrees rather like many platform characters do just before death!

Indeed, *Flubble* seems to mess about with quite a few of the more 'tried and tested' inclusions of classic platformers like *Super Mario* (NES) or *Crazy Sue* (Amiga). Amazingly, the fact that the fire button doesn't jump your dragon or produce a stream of bullets means that until you read the instructions, it's not immediately obvious what to do in the game at all.

The aim is, however, to collect the Squij characters, and a handy counter of those remaining is shown at the bottom right of the screen. Guided by the illustrated Squij at the bottom-right, and armed with the ever-powerful tail-spin, off you set on your mission.

The screen scrolls right only, and at a steady pace, keeping Flubble in the middle

of it at all times. Jumping is easily controlled, and your only real worry is that, after tail-spinning, Flubble takes a few seconds to recover. Nine times out of ten, this is no problem at all, as you will have already bounded into all the aliens you wanted to despatch, and his recovery period gives you a nice breather. On other occasions, you may have wiped out all the enemies you could see but also, in your exuberance, have pushed the screen so far to the right that another enemy is now making his way toward you.

The choice of alien sprites, the right-only scroll, the pipelines at the bottom of the screen and the jumping effect give *Flubble And Squij* a very similar feel to *Super Mario*. Unlike that classic, there's no timer to contend with and a certain amount of mental mapping is required to determine where the Squijs can be found.

This is really where the game falls down. Firstly, looking at the illustrated Squij situated screen-right leads you to suspect you need to find cutesy, green jellyfish – but actually some Squijs appear quite differently, hanging upside down, or appearing in cyan instead of green. Secondly, the teleporters (pipelines) usually teleport you backwards rather than to a wholly new area. It gets very frustrating trying to remember which Squijs you've collected already... and accidentally teleporting right back to the very beginning would be frustrating enough in itself. But when you also realise teleporting reincarnates all previously-killed aliens, it's almost enough to cause you to have the type of tantrum you hoped you'd grown out of!

The game has eight screens and is available on both tape and 5.25" disk. It's actually the type of game that may grow upon you with practice – there are inclusions like mushrooms that inject a bit of variety to the travails. However, in their regard, I have to sound a note of caution – shortly after I collected one, the game appeared to completely crash,

Flubble And Squij

Graphics 82%

Sound 83%

Playability 67%

Value For Money 70%

Overall 76%

causing Flubble to teleport uncontrollably every few seconds (and while being nowhere near a pipeline).

Hey ho. In summary, then, an excellently executed, cartoony platformer but one which, even in its 'remixed' form seems slightly rough around the edges. *Flubble And Squij* is available from Psytronik (www.psytronik.net).

Black Horse (Spectrum 48K/128K, RetroWorks, £4.99, tinyurl.com/zzbm3vc)

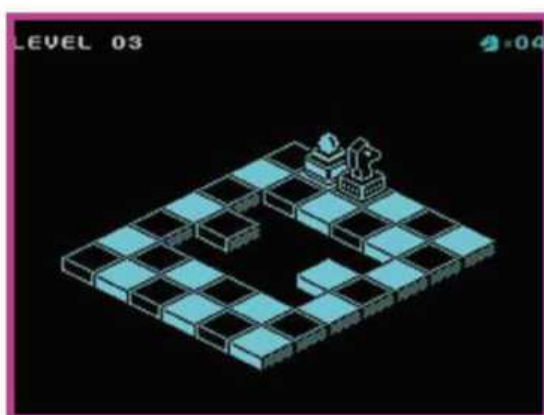
I'm far from being a great chess player; learning how to play it well takes a degree of study that I don't have the time for. However, I do know how all (well, most!) of the pieces move, which is useful if you're interested in *Black Horse*, a new Spectrum game from Digital Brains.

Starting the game draws a superior isometric 3D grid with your piece, the black knight, positioned on one of the squares within it. The grids are essentially 'cut outs' of a chessboard with the familiar white-and-black chequered pattern. What's different is that the grids aren't square. Instead, they have the look of jigsaw pieces, with sections that jut out in different directions.

The aim of each grid is to collect the 'star' token by manoeuvring your knight, which can only move like a regular knight chess piece, onto it. You start on a grid where collecting the star is easily done and progress through



▲ *Black Horse* – the king (well, knight) of the chessboard



▲ Navigate to capture the star on each screen



▲ Use the cursor to choose destination square

grids that introduce ever more features and enemy chess pieces.

Whether you like chess or not, the game is a good puzzler, and it has plenty of variety while being extremely intuitive to play. Full instructions are included and displayed before the game starts, but it's programmed so well that you're unlikely to need them. Perhaps the most important thing to point out is that, as you progress, it gets much easier to die. The enemy chess pieces behave in different ways depending on which grid you're attempting, and this can catch you off guard. For example, the king can only move one square in any direction, which means your knight can quickly outsmart him by moving so that a clear way to the star is opened, either with or without removing him from the board. You move, then he moves and, assuming you're still alive, you rinse and repeat.

However, on later grids, the enemy chess pieces do not move after you do. Rather, they lie in wait until you place the knight on a square that they can legally move to. Watching how (or if!) enemy pieces move after you make your first move will give a useful indicator of the strategy any particular grid will need. You have five lives to get as far as you can.

It's hard to get too excited (if you're me) about chess, but I would imagine there's a

ready-made market of *Black Horse* players. Essentially it's a cross between chess and Ultimate's *Alien-8* and, although it may be a puzzler at heart, the presence of the enemy pieces additionally introduces a competitive edge. You won't find the Spectrum 'thinking' for 60 seconds either; it moves its pieces instantly!

Black Horse is available from Retro Works on limited edition cassette for £4.99 or download free from Everygamegoing (tinyurl.com/zzbm3vc).

The Infeasible Game (Spectrum 48K/128K, Ian Munro, Free, tinyurl.com/hxao9z5)

Although Cronosoft is still selling new games for old formats, it has been uncharacteristically quiet as of late. Its Facebook page, however, did direct me to Ian 'Shape Shifter' Munro's latest Spectrum game. Called *The Infeasible Game*, it's an extremely smooth-scrolling platformer. All done in monochrome and featuring the type of graphics that could've been designed on graph paper, it regrettably has much of the appearance of an 80s type-in. Fortunately, there is a lot more to be said regarding playability.

You control an 8x8 chr\$ box that, after a quick pause to 'Get Ready', begins to scroll with the screen. You'll find you

Black Horse

Graphics 73%

Sound 60%

Playability 85%

Value For Money 60%

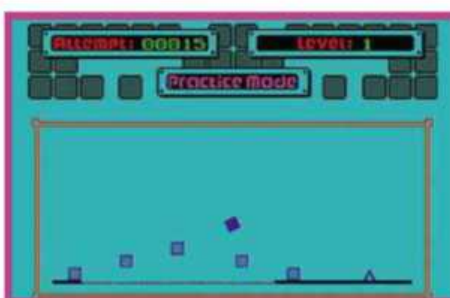
Overall 70%

need to press the spacebar to 'jump' – so that your box isn't propelled straight into spikes, or doesn't fly off the edge of the platform on which you're travelling. Jumping flips your box in a surprisingly spectacular arc – just the thing to either avoid those spikes, leap over a gap in the platform or, indeed, leap from the edge of one platform up to the start of another.

If you're familiar with *Flappy Bird*, then *The Infeasible Game* is a close cousin in terms of being a 'one-way only pseudo reaction test' of a game. The skill is in not coming to a sticky end (such an end sends you right back to the beginning for another attempt!). But while in *Flappy Bird* the aim was to keep your bird airborne and flying through the randomly scrolling gaps in the landscape of pipes, here it's not only about how long you survive but also how well you can remember the sheet itself.



▲ Infeasible by name, infeasible by nature



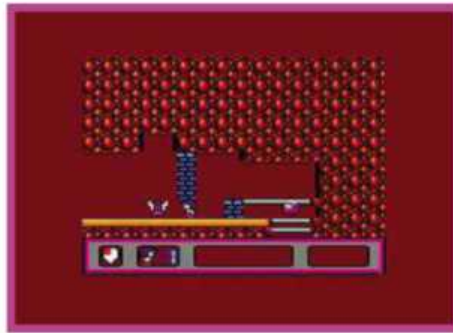
▲ The graphics are pretty basic



▲ If you drop a flag, it becomes a practice run



▲ *Concave is a joystick-only platform game*



▲ *The collision detection is awful*



▲ *Watch out for the spikes and stationary nasties*

As in *Flappy Bird*, you end up colliding with scenery a lot. Your biggest peril is the spikes, but even the innocent-looking platforms themselves are hazardous if you don't land on them correctly. Hence, to assist you in getting further in the game, and to prevent you being reduced to a gibbering wreck within five minutes flat, you can save your position at any point in your trek over the platforms by dropping a flag. If you're familiar with emulator save states, then you'll quickly cotton on to this technique. Drop a flag then die – as you surely will – and you'll return to the position when the flag was deposited, not the very beginning of the sheet.

Alas, dropping even a single flag turns your entire attempt at the sheet into a 'practice run'. You may indeed reach the end, but it won't count for anything except to help you memorise the sheet for a 'real' run, which must be completed without dropping a single flag.

Infeasible by name and infeasible by nature, it's not particularly impressive as a game concept. Firstly, as its name suggests, you're extremely unlikely to make it across even the first sheet without having to use the flags. Secondly, a big problem with using those flags is that you can drop one of them just before careering into a pit of spikes... and then get caught in an ever-repeating death loop. If so, the only option is to quit and start again. That's hardly encouraging stuff.

Nevertheless, *The Infeasible Game* handles well, and there's a pulse-pounding piece of music in the background that lifts the gaming experience. There's also at least one disorienting inclusion on the very first sheet: just as you're getting the hang of it, the

playing area suddenly turns upside down! There may well be further unexpected, and different, phenomena on subsequent sheets too. But it will be a very brave and, I suspect masochistic, player who ever sticks with the game long enough to see them.

Available only as an emulator file, you can download the Spectrum version on Everygamegoing (tinyurl.com/hxao9z5).

The Adventures Of Amy Concave (Amstrad CPC, Ego-Trip, Free, tinyurl.com/jscewy9)

This Amstrad game by Ego-Trip is actually the prequel to *Jewel Warehouse*, and features the same heroine, Amy, on a quest for crystals in a bunch of caverns. Unlike *Jewel Warehouse*, though, it's awful.

First to the instructions. As seems depressingly normal in the Amstrad world, it doesn't come with any. I'm tired of labouring this point in reviews by now, so let's just give it its first black mark and move swiftly on.

Next, it's joystick only which, quite obviously, means you can't play it without one. Now practically everyone plays Amstrad games via the WinApe emulator on their PC these days and, considering you can emulate a joystick through your PC's keyboard, this might not be too limiting – were not mapping those keys fiddly and time-consuming. Add this onto not knowing how to play, and you may wonder why you're bothering – before you've even moved Amy across a single screen!

Amy Concave is a platform game, and it employs an energy bar in the shape of a heart. This is depleted in quarters if you collide with spikes or a patrolling nasty. Regrettably, the collision detection is ridiculous, particularly in relation to stationary obstacles. Completely clearing them still eats up big chunks of your heart... and if you jump into a door for which you haven't collected a key, instead of bouncing off it as you might expect, you are instantly killed! There's also a

The Adventures Of Amy Concave
Graphics 25%
Sound 5%
Playability 30%
Overall 20%

very noticeable, and quite disconcerting, 'recalculation' of your lives and energy bar whenever you change room.

Dark red as a background colour is a very odd choice and, to conclude, there's no sound at all apart from a scale of notes whenever you jump and a buzz when you lose some energy.

Now that is a long list of complaints. Indeed, I wracked my brains in the hope of finding some reason – any reason – to advise anyone to play it. Alas, I came up with none. As the game was written with an arcade adventuring tool, about the best crumb of comfort I can offer Ego-Trip is to say it might be terrible due to the limitations of this tool rather than the programming skills of its author.

Amy does react well to controls, and the game itself does have a nice opener and game over sequence. And, of course, I have seen a lot worse.

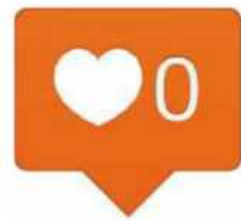
It's a shame that the Amstrad is being somewhat neglected at the moment, but you'd have to be pretty desperate for a new game to even consider giving this a go.

Download it (if you must!) from Everygamegoing (tinyurl.com/jscewy9).

And That's It!

I'm sure you'll agree that either I'm getting harder to impress or this month wasn't a vintage one. But don't be disheartened (even if you are an Amstrad owner). I have it on good authority that entries are flooding in for the Amstrad CPC RetroDev competition... See you next month! [mm](#)

The Infeasible Game
Graphics 10%
Sound 85%
Playability 40%
Overall 45%



Why Do Fake Accounts Want To Follow You?

Sarah Dobbs finds out what's lurking behind those fake names and faces

It's always exciting when a notification pops up to tell you you've got a new follower on Twitter (or Instagram, or Tumblr, or the other social media platform of your choice). Whether you've got 50 followers or 50,000, attracting more feels like an ego boost – it means someone's interested in what you've got to say! However, when you see that it's just a weird account with a fake name and a stolen photo as an avatar, rather than a real person, it's not very exciting at all. What's more, rather than making you look and feel more popular, these fake followers can actually be harmful to you and your credibility.

So where do they come from, what are they up to, and what should you do about them? Let's see...

Who Makes Fake Accounts?

In a word: scammers. There are a few different flavours of fake followers, and they differ slightly from one platform to another, but 99 times out of a hundred, we're just talking about spammers here. Generally, the accounts aren't being handled by real people, or at least not one per account; they're churned out by bot farms, and created in their hundreds. Usually, they'll grab names and photos from other accounts, as well as stringing together nonsensical bios in the hope that you'll think they're a real person. These accounts may also repost or outright steal posts and try to pass them off as their own, all to try to trick people into mistaking them for actual humans.

Once the accounts are set up, they'll start following people. They might be attracted by keywords (if you've ever tweeted about Apple products, you'll probably know all too well how many spammers are out there waiting to pounce) or just following at random. By following people, the scammers hope you'll follow their fake accounts back. And once you're following them, the real scam will begin.

Again, there are different kinds of scams that use fake followers, and some are more harmful than others. Sometimes,

they just want to spam out links in the hope of hooking an unsuspecting follower. Those links might lead to things they want to sell... or they might lead to sites hosting malware, or phishing scams. If you've followed a fake account back, they can also send you direct messages, and try to get you to fall into their traps that way. Basically, interacting with fake followers is a pretty dreadful idea, and not recommended.

Bought And Paid-for Fake Followers

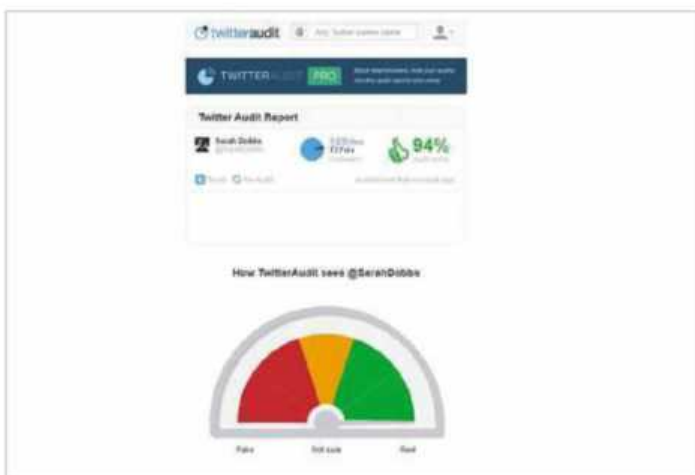
There's another kind of fake follower you'll come across if you're active on social media, too, and that's the paid-for kind. Now, if you use the internet to keep in touch with friends and generally chat to people you like, the idea of buying fake followers might seem utterly incomprehensible. However, if you're a small brand – a blogger, say, or an online shop – being able to buy a few thousand followers might sound like a good idea. Online credibility often comes down to how many followers you have, but building a large following can take time. Fake followers, on the other hand, can be bought pretty cheaply. Thus, almost overnight, anyone can make themselves look far more influential.

That's actually the kind of service that a lot of the fake followers you'll see appearing on your account are trying to sell you. Those kinds of spammers generally don't even bother to create a fake identity, instead naming themselves like "Buý Möre Föllöwér\$" so you know exactly what they're selling as soon as the notification appears.

There's an obvious drawback to buying followers, which is that they tend to be totally useless and obvious, and you won't get the same kind of engagement you'd get if you actually had, you know, 10,000 extra real people following you. Nonetheless, the illusion of being super popular still appeals to some people. That's a real problem for brands, because engagement is key – and fake followers are never going to actually buy anything from you. Worse, they could end up costing money, because platforms like



▲ *Buying fake followers is cheap, but has a hidden cost*



▲ *There are apps that can tell you how authentic your followers are – you might be surprised*

Facebook charge brands money to increase their reach, to make sure their posts appear in their followers' timelines. What's the point in paying to advertise to people who don't even exist?

How To Get Rid Of Fakers

In short, there's absolutely no benefit to having fake followers beyond looking slightly more popular than you otherwise would. So, if you're getting scammers following you, how do you get rid of them?

The easy answer is to delete them as soon as they pop up – preferably blocking and reporting them in the process, so that the accounts can be deleted by Facebook, or Twitter, or whoever. And the good news about these farmed fakes is that they're generally pretty easy to spot: just like spam email, spam accounts will tend to use bad spelling and grammar, or just post word salad that obviously hasn't come from a person you'd want to engage with. They're probably using either a porn star as their avatar, or haven't bothered to create one at all; on Twitter, that means they'll be using the default egg image as their user pic. Their account may also be chock-full of obviously dodgy links. Be careful not to click on any of those links while you're blocking them – just get rid of them!

If you're being inundated with fakes, or you're worried you might have a lot of fake followers scattered amongst your legitimate ones, there are apps available to help you weed them out, but they tend to charge, so beware of that.

Whack-a-mole

Ultimately, fake followers are just one more internet annoyance; another thing you'll need to be careful of when you're navigating the web. The good news is that, just as email providers developed increasingly effective ways of sieving out spam, social media companies are also working on ways of getting rid of fake accounts and making it harder for more to pop up. The bad news is, well, have you checked your spam folder recently? As long as people are willing to pay to buy fake followers, there'll be someone willing to meet that demand. So if you take nothing else away from this article: please, never be tempted to pay money for fake followers. It's really not worth it. [mm](#)

How The Networks Are Fighting Fakes

What happens after you report an account for being fake? And how are your favourite websites trying to protect you from scammers? Here's what their official policies say:

Twitter:

"Twitter takes fighting spam seriously, and we want our users to enjoy the service without being concerned about spam. Our anti-spam team continues to evolve and respond to new forms of spam to enable a spam-free environment on Twitter. While we have systems and tools to detect spam on Twitter, we also rely on our users to report spamming."

There's more in Twitter's rules about not creating automated accounts to follow people or respond to tweets, and obviously sending malicious links is prohibited. Twitter promises to remove accounts found to be in breach of these rules.

Facebook:

"We've built many tools over the years to help prevent and remove spam. Some of these tools prevent bad links from ever surfacing to people, while others help people clean up their accounts after an attack. We've also teamed up with some anti-virus partners to help with this process."

"On top of this, we rely on people to report spam when they see it. When these reports come in, they're reviewed and the content is removed if it's spam."

Facebook's policies also strongly advise against buying Likes, and warn that pages with fake Likes will end up finding it harder to reach real people due to Facebook's engagement algorithms.

Instagram:

"Help us stay spam-free by not artificially collecting likes, followers, or shares, posting repetitive comments or content, or repeatedly contacting people for commercial purposes without their consent."

Instagram's Community Guidelines discourage users from buying fake followers, and also encourages users to block and report any fakes they come across.

Tumblr:

"Don't register accounts or post content automatically, systematically, or programmatically."

Tumblr's guidelines sound a bit like they were listening to the *Grease* soundtrack while writing them, but make it pretty clear that fake accounts are not welcome. Again, there's a blocking process users can go through to get rid of these dodgy followers.

Android Wear 2.0: A Major Redesign

David Briddock explains what to expect from Google's Android Wear 2.0

Anounced at Google's I/O 2016 conference, Android Wear 2.0 received a warm welcome from the gathered developer audience. In scope, it's the biggest update since the original Wear launch in 2014.

What's new? Well, highlights include an updated user interface, a navigation redesign, extended messaging options, greater stand-alone independence and deeper fitness app integration.

Let's take a look at these areas in detail.

Simplified Navigation

The Wear 2.0 user interface looks much cleaner and more uniform thanks to a comprehensive overhaul. It still has a Material Design (google.com/design/spec-wear) theme, but under the covers there are lots of changes.

Take gestures, for example. The previous Wear incarnation involved a rather complex combination of up-down and side-to-side swipe gestures. In fact, Google found many users become confused,



▲ *Wear 2.0 Developer Preview features*



▲ Wear 2.0 apps



▲ Wear 2.0 Complications

not remembering whether to swipe down or right to see more information, or how to go navigate back.

Some things are the same. A down swipe from the watch face still brings the quick settings card into view, but now there are a few more things to play with, such as flight, silent and do-not-disturb modes.

However, a left or right swipe from the watch face now slides in the watch face picker. This was previously done with a long press. In

“ With Wear 2.0 you can have the data you want on the watch face you love ”

fact, the revised user interface sees the almost total removal of long-press actions for consistency reasons, following user feedback.

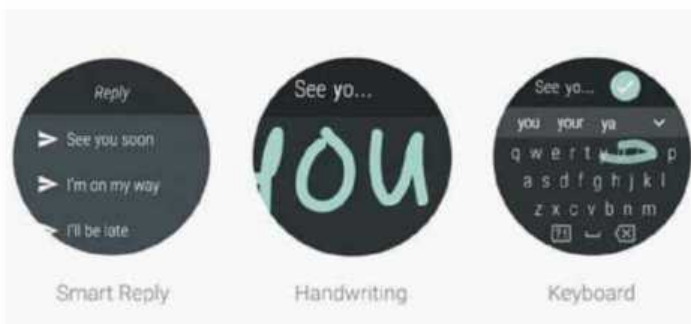
Also from the watch face, a press of the crown button brings up the new app launcher menu. This has been redesigned to show the app list in a more stylish way. In particular, it takes full advantage of the screen area offered by circular-faced watches.

When away from the watch face, somewhere in a navigation flow, pressing this crown button will take you back to the previous display. This is easy to learn and facilitates a rapid return to the watch face.

The Complications API

Glancing at a smartwatch and only seeing the time is rather missing the point. A better solution is to incorporate additional non-time information. In the watch industry these are called ‘complications’, and with classic watches they include things like the date, current moon phase and so on.

Up to now, developers had to write custom code to create these watch faces. And they did. Today there are over 4,000 Wear watch faces to choose from, but at I/O 2016, Google announced the Complications API.



▲ Wear 2.0 input options

This API considerably greatly simplifies the developer's life, opening up a range of powerful techniques that pass raw data right to the watch face. Importantly, developers can format and graphically style this data to complement the watch face. In other words, with Wear 2.0 you can have the data you want on the watch face you love.

All this functionality is wrapped up in a widget, with up to four widgets embedded into a watch face (see image). Tap a widget and the corresponding app opens up to reveal the full user interface.

Yet with this powerful API, developers can go even further. It's now also possible to utilise the watch face background to convey information. For example, a reddish background might slowly deepens in hue to indicate a rise in air temperature, or coloured pulses might convey a wearer's heartbeat.

Notifications Improvements

Notification alerts are a more subtle affair in 2.0. What pops up now is a small icon or contact image, rather than something that dominates a large part of the watch face. Use a simple swipe up gesture to reveal the notification card stack.

History Of Android Wear

The Android Wear platform for smartwatches and other wearables was first announced in March 2014. Based on the Linux kernel, this operating system supports 32-bit ARM, MIPS and x86 processor hardware.

Google also named a number of Wear device manufacturing partners, including Samsung, LG, Motorola, HTC and Asus. To kickstart developer community involvement, Google provided a usable preview release, although the stable Wear 1.0 version didn't actually appear until June 2014.

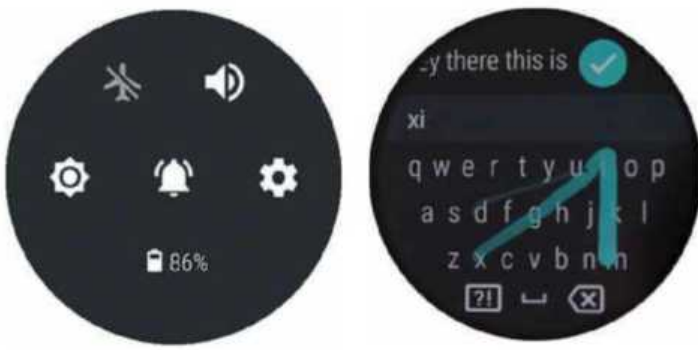
Right from the start, Wear supported square, rectangular and round smartwatch face styles. The first model shipped was the LG G Watch, followed soon after by the Samsung Gear Live and the round-faced Motorola Moto 360. Accurate sales figures are hard to come by, but various estimates suggest that more than 700,000 units were shipped in the first six months alone.

Wear 1.3 appeared in August 2015. Based on Android 5.0 (Lollipop), it offered interactive watch faces, plus improvements in performance and battery life. Wi-fi support was added to complement the existing Bluetooth wireless connectivity. Also in 2015, Google introduced a pairing app for iOS. This app was designed to provide support for receiving iOS notifications, but unfortunately for iPhone owners compatibility was limited to just a few Wear smartphone models.

Earlier this year, Google released Wear 1.4, this time based on Android 6.0.1 (Marshmallow). This version had a greater range of gestures and could send voice message, receive voice calls and play music without having to involve a tethered smartphone.

Today, the hardware manufacturing partner list has grown considerably. It now includes Sony, Huawei, Broadcom, Intel, MediaTek, Imagination Technologies, Qualcomm, Casio, Fossil and TAG Heuer. Millions of Android Wear devices have already been sold, and the Android Wear platform accounted for more than 10% of the worldwide smartwatch market in 2015.

The release of Wear 2.0 should mean this market share is set to increase considerably in 2016 and again in 2017.



▲ **Wear 2.0 Quick settings**

▲ **Wear 2.0 Swype-like keyboard**

Cards are opened with a tap and dismissed with a left or right swipe. To help with orientation when presented with a stack of notification cards, Wear 2.0 uses a small progress bar as a positional guide.

As for the notification cards themselves, they are now presented via a Dark UI. Presenting light text on a dark background is certainly helpful in low light situations. But a darker background also means you'll get more battery life on OLED display watches, which require more power to display lighter colours.

The redesign also ensures notifications cards, and the card stack progress bar take full advantage of the round watch face models, which are increasingly appearing thanks to consumer demand.

Enhanced Messaging

Messaging on a smartwatch, with its severe display size limitations, isn't a very rewarding experience. Before Wear 2.0, the message input options included a sometimes flaky voice dictation and a few quick replies.

What's new in 2.0 is a Swype-style word-tracing keyboard (including a special password-centric version) and a watch face ink scribble function.

Fitting a keyboard onto such a small display means the keys are, as you'd expect, tiny. While some preview users found it a little fiddly but okay, others struggled to achieve the required accuracy and declared this new feature to be largely unusable.

An ink handwriting recognition mode is an interesting addition. Being able to scrawl onto the watch face and see your marks transformed into characters and words may be quite useful in certain situations – entering people and place names, for example.

Let's face it, a smartwatch is never going to be as proficient as a smartphone, tablet or laptop for messaging on the move. But extending and improving the input options is very welcome nevertheless. And all apps that previously supported voice input will now have the new keyboard and ink options available by default, without any code changes.

In addition, we can look forward to the upcoming Google Assistant conversational technology helping voice interface accuracy and personalised Smart Replies (both of which we talked about in issue 1417).

Stand-alone Apps

One of the biggest problems Android smartwatch owners face is the reliance on a Bluetooth-connected smartphone. A tethered smartphone is needed to install apps, connect to the cloud, access Google Fit data and more. Even worse, certain smartphone operating system versions only offer limited functionality.

Google found users were frustrated with this restriction. Fortunately all that changes with Wear 2.0 thanks to the introduction of stand-alone apps.

Stand-alone apps can make direct wireless connections to the cloud over Bluetooth, wi-fi or cellular (for those few devices that offer this functionality). As you'd expect, this is much faster and more reliable than the previous smartphone-in-the-middle process, which was again constrained by your smartphone's operating system version.

Stand-alone apps have full access to Google's Firebase Cloud Messaging functionality. The same unfettered cloud access allows apps to be directly installed from the Play store. In addition, these apps are able to conduct Android Pay transactions.

While stand-alone apps are a great thing for consumers, app developers need to ensure they code in an appropriate manner. For instance, to avoid depleting the battery too quickly, apps should make intelligent use of the 'Light Doze' and 'Full Doze' standby modes. And they should only download the data they really need.

“ **Stand-alone apps make direct wireless connections to the cloud over Bluetooth or wi-fi** ”

Fit Platform Improvements

The Google Fit platform (developers.google.com/fit) has also received some attention. Just to recap, Google Fit is an open ecosystem repository, which stores health and fitness data from a cross section of wearable devices or other sensors. This data can then be retrieved for analysis by a variety of devices.

Firstly, the new Google Fit software can automatically recognise when an activity is taking place and immediately start recording data. This completely absolves the user from having to first set their smartwatch into the required activity mode.

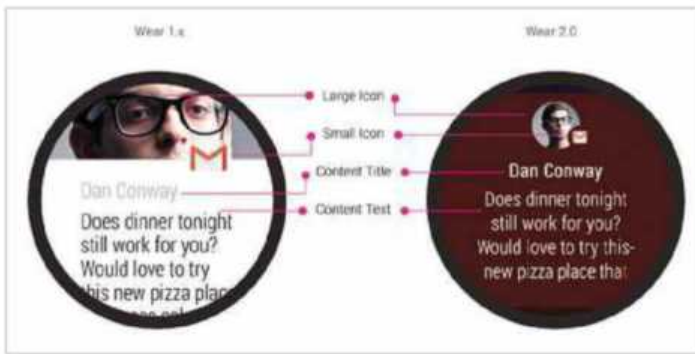
The recognised activities include walking, jogging, cycling and gym workouts. This means if you decide to take an impromptu lunchtime jog or even just run to catch the bus, this activity data will be captured and logged. This feature helps construct a more accurate

Going Round

Android Wear has always supported square, rectangular and round watch face styles. However, sales figures indicate round face smartwatch models, such as the Motorola Moto 360, are the most popular shape. This could be down to classic watch face conventions, or maybe just to distinguish themselves from the non-round faced Apple Watch.

Yet a round face presents considerable challenges for software developers. For decades, computing displays have been square or rectangular. Consequently, there's a distinct lack of support for round displays across all the standard graphical software libraries.

So the fact that this latest Wear release uses much more of the circular display is strictly down to lots of hard graft by Google's internal development teams. Yet, it's still a relatively new technology domain, so further user interface enhancements are bound to follow.



▲ Wear 2.0 vs Wear 1.x notifications

activity picture, so it's easier to assess progress against your daily or weekly targets.

The app themselves can now be smarter too. The new Wear 2.0 stand-alone app feature means they can communicate directly with health and fitness data in the cloud, without having to rely on smartphone or other mobile device support. And they'll automatically receive notifications when Fit data changes, rather than having to manually poll for updates.

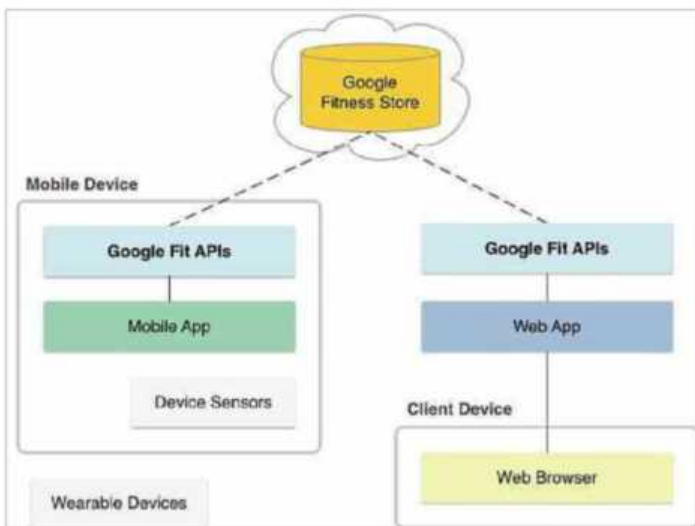
Hardware Support

To promote the features of Wear 2.0, Google created the g.co/Wearpreview website. This site has links to detailed developer information and early Wear 2.0 developer preview downloads.

As of early July, the preview edition is only available for the LG Watch Urbane Second Edition or the Huawei Watch (goo.gl/4wvvnvf). But then again this is a very early version aimed at the developer community, who are expected to provide feedback about features and bugs.

When Wear 2.0 moves into its beta phase, probably in early autumn, we can expect much wider hardware support. How wide? Well, the existing Wear software has worked on all Android Wear watches going right back to the original LG G Watch and Samsung Gear Live products. We'll have to see if Wear 2.0 turns out to be a little more choosy.

However, we can be fairly optimistic. After all, the vast majority of Android Wear smartwatches are built around the same Snapdragon 4000 system-on-a-chip (SoC) processor. And Google has already posted press pictures showing Wear 2.0 running on a second-generation Moto 360 (goo.gl/VoDmc6) and the Asus ZenWatch 2.



▲ Google Fit Platform

Wear 2.0 Promise

The smartwatch marketplace is still an embryonic one. Many consumers see no need for a fancy and expensive watch. In fact, the younger generation of smartphone and tablet owners typically tend not to wear a watch at all.

Even so, an Android Wear smartwatch running Wear 2.0 is a far more capable device. And as the Apple Watch also needs plenty of assistance from a tethered iPhone, it could push smartwatch buyers towards a Google solution.

Stand-alone app functionality and direct-to-cloud wireless connectivity are major additions. In particular, it's going to make buyers feel they're getting more of a functional, value-for-money product, rather than a smartwatch-tethered wrist-worn accessory.

Health and fitness technology is a fast growing area and, as we've seen, Wear 2.0 has more to offer in this area. But there's also a large and ever growing range of health- and fitness-specific wearable technology, which may offer an enhanced user experience, better value or both.

Rosy Future?

Is this major update enough to generate increased Android smartwatch sales? As always, Google is reliant on the developer community to make the most of these features. Consequently, we can only start to assess what difference Wear 2.0 might make at the end of 2016.

By then we should also see what developers have achieved with their Apple Watch models powered by WatchOS 3 (see boxout).

Who'll win the smartwatch battle: Google or Apple? Write to letters@micromart.com and tell us what you think. [mm](#)

Apple WatchOS 3

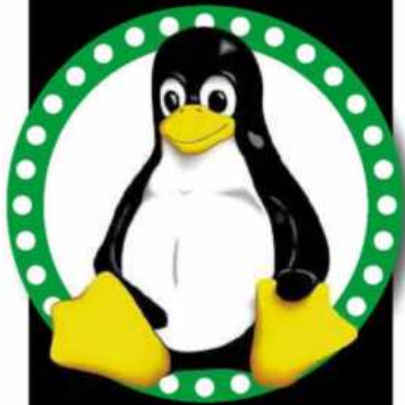
At its June WWDC developer conference, Apple revealed the new features of WatchOS version 3, the latest Apple Watch operating system. So what's new?

In WatchOS 3, apps will run much faster. It has new swipe gestures for watch face and app selection. There are new complication opportunities to design more interactive and informative faces. You can now scribble messages in multiple languages using finger ink. There are Fitness app improvements too, which include exercise incentives along with data sharing. And there's full Apple Pay support.

Sound familiar? All in all it's a remarkably similar set of features to Android Wear 2.0. In fact, it's almost like both presentations used the same script.



▲ Apple WatchOS 3 faces



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

Communicating With Open Source

A Skype alternative that's worth checking out

I was looking for an alternative to Skype the other day for my Linux PC. There are a few out there, each with its own unique take on the video calling concept, but the one that really impressed me was Jitsi.

I'm not sure how on earth I managed to miss out on Jitsi, as it's been around since 2003 – although it was formerly known as SIP Communicator. My guess is that I actively avoid any form of video

it's cross platform, for Linux, Windows and Mac.

Plenty Of Options

The stable build line includes an MIS for Windows and the installation packages for Mac OS X, but there are plenty of options for different Linux distros. There are Ubuntu packages, including a repo, Debian packages (with a repo), RPMs (again with a repo) and Arch packages. And the source code is available

use it chat to the relations on the other side of the planet. And with Jitsi, at least you're not locked into a video chat client's network – and one that's usually not secure.

Handy Apps

Using Jitsi made me think, though, of all the other alternative programs that we use in Linux that we take for granted. There are the usual office-type programs, and image and video programs too, but there are also countless other quick and easy tools that offer a surprisingly wide range of options to users regardless of whether they're running Linux or some other OS. Perhaps it's worth you, the reader, getting in touch with Micro Mart and letting us know what alternative programs you use frequently, that other readers may not have heard of before.

After all, that's what the open-source community is all about. Until next week, folks.

“ At least you're not locked into a video chat client's network ”

calling if I can help it; I hate talking to people on the phone too, but then I'm just a kind of anti-social person.

Anyway, Jitsi impressed me for a number of reasons. First and foremost was the security aspect. Where Skype, Google and Facebook are known to record your conversations, Jitsi offers end-to-end encryption of both video and voice calls, as well as text.

Secondly, it's easy to, and it that works remarkably fast with as little bandwidth as possible – the caller on the other end had a very poor connection, but there's no lag.

And thirdly, not only does Jitsi have all the usual communication features; it also allows you to capture and stream your desktop. Plus

too for those who prefer to build the package themselves.

The Jitsi Media Library is a separate download that offers the various codecs needed to allow programs to capture, play, stream, encode and decode your calls or desktop capture.

Needless to say, there's plenty to get your teeth into with Jitsi, even if you only ever

▼ *Jitsi, a video chat client that's ahead of the game*



Macback

It turns out Craig Grannell is a fan of old Macs, right up until he has to use one

There are two different types of people when it comes to computers. One type plonks themselves in front of a glowing screen for a bit, does what they need to do and then leaves. They don't care a jot about the computer in question. It could be furiously smashed to pieces by angry fists and quickly replaced the following morning before they arrive to work, and they'd be none the wiser. As long as they have access to email and the web, job done.

But the other type of person – and I'll count myself squarely within this group, and assume most of you will be too – finds a computer can quickly become an extension of them. It's customised and personalised. You know where everything is. And it works in just the way you expect it to. This is, clearly, something of a problem when you find yourself in a position more like the other type of computer user. In fact, it's infuriating.

Typing up this column now, I am several thousand miles away from my main work computer, an iMac stuffed full of RAM, and that boasts a huge display. Instead, I'm hunched over a cramped desk while ostensibly on holiday, working on a fairly old 13" MacBook Pro, because it turns out there's no way a 27" iMac will fit in your hand luggage, no matter how hard you try.

To say it's been a rude awakening is an understatement. Wisely, I didn't think to boot from my backup drive prior to leaving, and it turns out drive and Mac don't get on at all,

leaving me stranded in a relatively vanilla account. I'm missing software and utilities I usually rely on, which would be bad enough if the screen wasn't so small, and the trackpad not so annoyingly flaky. It's a far cry from my iMac's deft combo of Magic Trackpad and Wacom tablet.

The dawning realisation throughout has been that this is how the other half live, all the time. How do they manage it? I imagine this is why many of them hate computers. Here I am, smashing words into shape, when I mostly want to smash this notebook with a mallet. It's slow, clunky and takes approximately 11 days to perform basic tasks in Pixelmator, which my iMac would merrily blaze through in seconds when armed with a suitably recent copy of Photoshop.

Naturally, this is the epitome of first-world problems. It's not like I'm currently being forced to chisel my words into a stone tablet and have them shipped to Micro Mart's editor, nor dictate everything down a crackling phone line to put-upon production staff. I'm still

sitting in front of a relative marvel of technology, connected to the web, using a machine capable of a dizzying number of calculations per second. Just half a decade ago, this Mac was the pinnacle of mobile computing – the kind of kit people would give their eye teeth for, rather than the kind of kit you want to punch in the teeth. But no more am I excited about its once-futuristic form – this notebook is now a breeze-block compared to a svelte modern Mac, making it annoyingly uncomfortable to type on. And the non-Retina screen's pixels are like tiny daggers stabbing my eyeballs upon every glance.

Still, when faced with another hour in front of this aging Mac, I'd sooner launch myself repeatedly at a brick wall. On that basis, procrastination is way down and productivity is up. Perhaps there's something to this 'using old and rubbish' computers lark after all.

▼ *The horror! So chunky! It's like using a VIC-20 while wearing boxing gloves! And so on*



Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find Craig on Twitter at @craiggrannell

Mac



Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

N Is For Nougat

Ian McGurran chews down on the details of the latest version of Android

Unlike KitKat and Marshmallow, in the dim and distant past the sweet, chewy confection we now know as nougat – pronounced noo-gar – was more often pronounced nuggat. So while most of the UK will now call the latest version of Android, Noo-gar, there might still be those who staunchly refuse to call it anything other than nuggat. But while the pronunciation may split people's opinion, Android as a whole is doing very well with all sides, thank you very much. So well, in fact, that it's dwarfing even iOS's stats, with 80.7% of the market share, compared to iOS's 17.7%.

Version N, previously suspected to be named Nutella, looks to continue that upward trend. From the ground up you'll get the delight of split-screen applications on both phone and tablet, and a night mode like that seen in the Twilight app and recently introduced to iOS (though there's the chance it might not make it to the final version). Plus there are genuinely useful features such as improving on the already excellent Doze battery life saving feature by being more iOS-like and aggressive in cutting the power from apps and processes not in use. And if there's one thing where iOS still has Android licked, it's with far superior standby battery drain. There are even rumours of a similar guided help system to the Mayday

online help on the Amazon platform, with shared screen help from an Android expert. For those of us with friends and relatives who still don't gel that well with technology, this could be a real sanity-saver, as long as it does appear here in the UK.

With the announcement of Nougat comes both the elation and disappointment of which devices will – and will not – get the next generation OS when it's released. There's no surprise in finding that the current generation of Nexus devices (5X, 6P, Pixel C), as well as debuting on the next-generation Nexus lineup, the leaked 6P replacement, Marlin, and the 5X replacement, Sailfish, from HTC. The 2014 Nexus 6 phone and Nexus 9 tablet will also play host, as will one of the Android One budget handsets, the General Mobile 4G. In fact, all these devices can go grab the N beta 4 right now, if you fancy an OS that probably isn't ideal for day to day, but quite suitable for a second handset or tablet.

But as devices age, so the official support tends to drop away. So while the Nexus 5 is still regarded as one of the best Nexus devices, and in terms of power, it's still just ahead of the latest Moto G, it won't be getting Nougat, at least not officially. The same fate befalls the 2013 Nexus 7, with its older 2012 brother, the larger Nexus 10 and the Nexus 4 being cut off from the Marshmallow party last year. But all is not lost; a

protest against the Nexus 4 not getting Lollipop did result in the device eventually getting version 5, so it's not impossible to see Nougat landing on the 5.

Other devices that should get it include the Moto G, E and X line up of 2015 and 2016, because Google Play Experience devices, even those now owned by Lenovo, have to offer two or more years of updates. We will also likely see it for the flagships from HTC, Samsung, Sony and such too, though the older they are, the longer it will likely take.

Of course, there's always the other way: with a custom ROM. The likes of Cyanogen, MIUI and the rest won't, of course, be able to do anything until the code is released, but after that it'll be open season, with even the likes of the Nexus 4 and original Moto G likely get at least CM14. So until then we just have to wait, though with this year's seemingly accelerated issue of betas, it may not be that long to wait, with a release possible before the usual late September / early October date.



Tickets To Thrive

Andrew Unsworth looks at options for creating a gaming arcade in the home

Last week, I talked about arcade machines and how there doesn't seem to have been much innovation in the last decade, apart from a few standout examples. This is a shame, because throughout the 1980s, and even in the 1990s, arcades pushed boundaries and demonstrated the state of the computing and gaming art.

Thanks to their novel cabinets, excellent graphics, phenomenal multi-channel sound and addictive gameplay, arcade machines positively influenced computer and video games on home-based machines. I'll never forget being blown away by the graphics, sound and gameplay of *Ghouls and Ghosts* when I first saw it on the Sega Mega Drive. It seemed arcade perfect, even down to the need to press a start button. All it missed was a coin slot.

I'm sure arcade machines will come into their own again once games designers and engineers use the latest virtual reality, projection and robotics technologies to produce innovative new cabinets and fresh game styles, but until then, what to do?

If you're an inveterate old-school gamer, then you can create a home arcade by purchasing old (or even new) arcade machines and storing them in your home. There are a number of companies that sell new and second-hand arcade machines.

One company that caught my eye is Home Leisure Direct (www.homeleisuredirect.com). It has a showroom in Bristol, which looks well worth a visit, although I'd imagine it's hard to resist the temptation to flex the plastic in your wallet once confronted with the wondrous wares within. I'd really like to go some day.

Not only does Home Leisure Direct sell new and reconditioned arcade machines, it also sells pinball machines, football tables, air hockey tables and jukeboxes among other things. Listed on the company's website is a refurbished double unit **Time Crisis 2** machine for £1,997. Sadly, there were none in stock when I looked, but even so, that doesn't seem such an outlandish price for a piece of classic arcade brilliance.

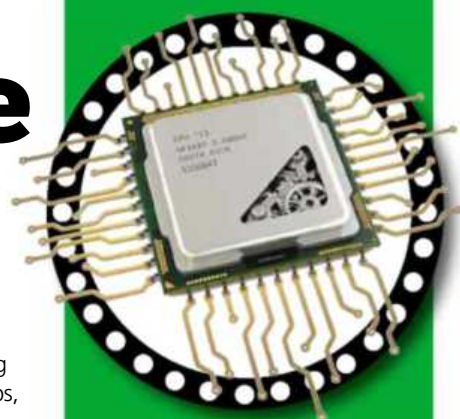
Another online stockist is Liberty games (www.libertygames.co.uk), which has a good selection of games on its website, including a recreation of the classic *Galaga* (*Galaga Assault*, tinyurl.com/z8ykq82).

Apparently, *Galaga Assault* has a "novelty redemption mode", which involves swapping tickets for extra lives. The issuing of tickets by arcade machines is nothing new (I remember playing for tickets and hunting for discarded tickets back in the mid-80s at Minehead Butlins), but it does seem to be more integrated with regular arcade machines, judging from a recent trip to a seaside arcade. Not only did we

get printed tickets for whacking moles and getting balls in hoops, we also got tickets for playing *Bejeweled*. Sadly, there were no tickets output by the *Time Crisis* machine, but you can't have everything. Once collected, the tickets could be traded for a receipt by feeding the string of tickets into a machine, and receipts could then be swapped for a novelty at the 'shop'.

The use of tickets to buy prizes is a neat idea from a business point of view, because it adds an extra element to the gaming experience. You want to walk away with something from a fun afternoon's gaming, so you stock up some tickets and treat yourself to a bag of sweets or a novelty gnome.

Whether you want to recreate your own arcade at home or enjoy the full-on arcade experience as it's meant to be experienced, one thing is certain: we should support our arcades so that future generations can enjoy them.



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Hardware



Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Gaming

Sleep With The Fishes

Forget Ecco The Dolphin, undersea adventure Abzu looks like the swimming simulator to beat. It's from the designer of Journey, so it should be great

This week, Ryan takes a look at the ambient swimming simulator Abzu, and checks out the final moments of the long-running MMOFPS, Planetside...

Plug & Play

Had a tough day at work? Gloomy events on the news getting you down? Then bathe your eyes in the new trailer for *Abzu* (youtu.be/e9d8YjpJgiU), the debut game from Santa Monica-based studio Giant Squid. Best described as an ambient swimming simulator, it involves exploring the depths of an exotic and azure blue ocean teeming with life and mysteries. You know how underwater sequences in a lot of games can be syrupy and frustrating? This isn't one of those games. You're not constantly struggling to find oxygen, and to the best of our understanding, none of the creatures in *Abzu's* ocean want to eat you. Instead, the game's simply about the experience of exploring the rich alien world beneath the waves, where whales and shoals of fish shimmer around the remains of submerged cities.

With its stylised visuals and graceful music, *Abzu* looks and sounds quite a bit like *Journey*, an out-and-out classic indie game which came out exclusively for the PlayStation 3 a few years ago. There's a good reason for this: *Abzu's* from Matt Nava, who was the art director on that

game and other titles at Santa Monica Studios. Like *Journey*, *Abzu* also employs the services of composer Austin Wintory, whose music sounds both melodic and alien all at the same time.

According to the developer's website, *Abzu's* about universal myths and how they're carried between cultures; its title apparently comes from two ancient words that mean "ocean of wisdom". If that sounds a bit pretentious, rest assured there is a game beneath all the soothing graphics and whale noises.

Journey was a third-person adventure game that involved solving environmental puzzles to unlock gates to new areas, and it looks as though *Abzu* is a development of those ideas; although the environments are large, it's a linear rather than sandbox experience, with specific objectives to achieve before the next area can be tackled.

There's also a mechanic that allows the player to emit a burst of sonar; this attracts schools of nearby fish, which in turn give the player an energy boost allowing them to swim more quickly through the depths. We'll also be able to move around more quickly by clinging onto larger fish, such as the fin of a whale.

There are hints that some kind of advanced civilisation awaits us down there in the ocean. Could it be the remains of Atlantis, or something more otherworldly? On the strength of the designer's previous games alone, we're looking forward to finding out.

Abzu's out on the 2nd August.

Online

Well, we can't say that *Planetside* didn't have a good run. Launched in 2003, the online multiplayer shooter has weathered the slings and arrows of a changing videogame landscape, and even managed to ride out a shift to a free-to-play model in 2014. However, with its successor (the imaginatively-titled *Planetside 2*) active since 2012 and its engine beginning to look its age, *Planetside* has finally reached the end of its life.

Daybreak Games made the announcement in mid-June, with *Planetside's* shut-down date scheduled for the 1st July.

"While we have run the game for free since 2014, due to evolving business needs and technical requirements it has become necessary to conclude this service," Daybreak wrote



▲ At 13 years old, *Planetside* was one of the oldest MMOFPS games, and it was finally put out to pasture on the 1st July – in spectacularly fiery fashion

on its website. “We hope you will take this opportunity to enjoy the remaining time available with each other and please help us give *PlanetSide 1* the sendoff it deserves.”

That sendoff was actually pretty dramatic: on that fateful July day, players watched agog as meteorites rained from the sky, providing an apocalyptic end to one of the earliest MMOFPS games. The moment was recorded by one *Planetside* player and uploaded to YouTube, and the video (youtu.be/t0i-vlzRHEw) shows dozens of players milling around the landscape

as fire streaked through the sky above. There are gasps and exclamations of horror (some decidedly not safe for work, so you have been warned). As a final notice flashed up on the screen – an indication that the game’s servers had been shut down for the final time – some players expressed their appreciation for the hours they’d spent battling away on the MMO.

“Thank you *Planetside* for all the memories,” one player said, before adding (and we’ve edited the quote for language): “and also [messing] up my GCSE results.”

Planetside isn’t the only online game Daybreak’s shutting down, either. The online card game *Legends Of Norrath*, a spin-off from *EverQuest* and *EverQuest II*, is also getting the chop; while it isn’t as old and established as *Planetside*, it’s still been going for nine years, though Daybreak admits itself that development on the game has been on the back burner for several months or so now.

“*Legends Of Norrath* has not had an active development team for quite some time,” Daybreak wrote, “and in the best interest of our company and players, we have made the difficult decision to close the servers.”

Legends Of Norrath will shut down on the 17th August, which gives players a few more weeks to claim their last few unopened packs of cards and loot rewards. As for Daybreak, it still has plenty of other games to maintain and develop; the *EverQuest* MMOs continue to draw a loyal crowd, while its zombie survival game *H1Z1* has its *King Of The Hill* PvP mode, due to emerge from Steam Early Access this summer.

Incoming

Having started with something soothing, let’s end with something nightmarish: *Scorn*, the forthcoming first-person horror adventure influenced by the work of the late Swiss artist, HR Giger. If you’ve seen *Alien*, you’ll be vaguely familiar with Giger’s dark imagery, which often looks like medical illustrations stolen from another planet. Here, you’re effectively lost in a series of his bio-mechanical landscapes – with doors that pulsate and ooze as they open, huge machines resembling throbbing internal organs and freakish, hairless creatures that may or may not be out to get you. Serbia-based studio Ebb Software says there’ll be plenty of puzzles to unlock in its surreal game and, while there’ll be a bit of shooting (your weapon’s a David Cronenberg-style gun made of bones and flesh), bullets will be scarce.

Scorn’s due for release in 2017, but you can already vote for the game on Steam Greenlight. You can read more about Ebb Software’s gruesome work-in-progress at www.scorn-game.com. [mm](#)



▲ Here’s one game we’ll probably play with the lights left on: the forthcoming first-person horror game *Scorn*, with visual designs inspired by the artist HR Giger

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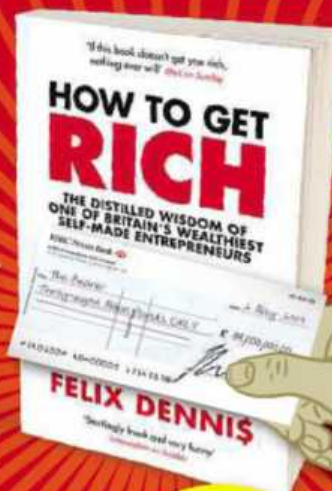
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WANTED: You bought a Corsair water cooler, with a square block. You fitted it to your Intel processor. You want to make a few pounds from the spare A.M.D. bits? Contact me!
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WANTED: Gigabyte GA-Z77X-D3H motherboard wanted.
Email: johnbeiry@gmail.com

WANTED: PC Tower case (beige colour if possible) to rehome an Amiga A1200 vintage computer. The Amiga motherboard is H 410mm x L 190mm (H 16" x L 7.5"). PSU not an issue but if available 250 watt more than enough.
Tel: Bill (07742) 061569 or (02641) 769503.

WANTED: 3G dongle for Archos 80 G9 tablet.
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Wanted: PictureToExe software, for making picture shows.
Tel: (01202) 610602
Email: ivor.mary@talktalk.net

Wanted: Quicken 2001. I desperately require a copy of QUICKEN 2001, UK Edition. I need to reinstall the program but have lost my original installation CD.
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them to just one question
per letter, simply so we
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Aaron

GeForce Upgrade

I was looking to upgrade my graphics card from an Nvidia GTX 750Ti to an Nvidia GTX 970.

I like playing the latest games. Is this a worthwhile upgrade? Is it worth upgrading the RAM to 16GB as this will be difficult to get soon as my PC is quite obsolete.

At just under £220, I found what looks like really good value deal at www.novatech.co.uk. This is for an MSI GTX 970 Armor 2X with 4GB GDDR5 RAM.

My PC:

PC intel i5-2400
8GB Fury RAM
Gigabyte NVIDIA GTX 750Ti 2GB
Gigabyte GA-H81 (I think).
Kingston SSDNow V300 480GB
2x 2TB disks
Corsair CX Series CX750M ATX Power Supply

Andrew

The graphics card you've got already is fairly decent for some gaming but, as you're almost certainly finding out, will likely struggle with later titles – especially at higher detail settings. Therefore, your proposed upgrade will certainly give you a boost in terms of the graphical power of your current system.

The GTX 970 is more powerful, with much more RAM and a more heavy duty GPU than your current model, so I'd expect the latest games to run well enough. However, there's a

major difference in form factor between the two cards, which could be a problem.

Your older GTX 750Ti is a half-sized card, whilst the GTX 970 is a much larger, dual-cooled model. This will not only require much more room inside the PC, but also a lot more power to run. You note that your current power supply is 750W, so should be okay, but many heavy gamers prefer a PSU of at least 800-1000W. That's even more necessary if any overclocking is planned. I'd advise you double-check the available space inside your system before you buy, just to make sure.

As for your proposed RAM upgrade, this isn't as important in my opinion. Whilst more RAM will almost always lead to better performance, you already have 8GB fitted, which is plenty for most games. Still, if you can afford it, 16GB is supported by your board (the maximum amount), and it'll help run the latest games as ultra level detail.

Another concern you may have is an area you've not mentioned, and that's your CPU. The i5 is a good chip, but it's not cutting edge, and for gaming I'd always recommend you go for the i7 range. These offer much better performance, and your i5 may end up creating a bottleneck of sorts for your more powerful GPU and extended RAM. It may be worth upgrading your CPU ahead of the RAM. Your i5 will be okay, but you'll likely need to scale back on detail for the system to cope.

▼ **Upgraded GPUs will deliver better performance, but don't forget the CPU**



Helpful Remote

As the person with the most computer knowledge in my friends and family, I often find myself being called up at all times for help with various problems. I can help with some of these, but sometimes it's just too hard to explain something, and I really need to be in front of the PC in order to help. I'm sure you understand this.

Although I know a bit about PCs, I'm still what I like to call an advanced amateur, and I've not used certain kinds of software, and remain a little ignorant in some areas. In particular the one area that would be very useful is remote control, which I've been reading about. I feel this would be a great help, and I could solve any problems over the phone, and actually see what's going on.

I'm just not sure how the best go about this. I know there are a lot of different options, but I need one that's easy to use for me, and more importantly, easy to use on the other end, as some of the people I help are just not technically minded, and having to handle more software wouldn't work.

Can you suggest the best option here? I'd ideally like a free option, as my budget is limited. I'm running Windows 10, and to my knowledge, so are most of my 'customers'.

Barry

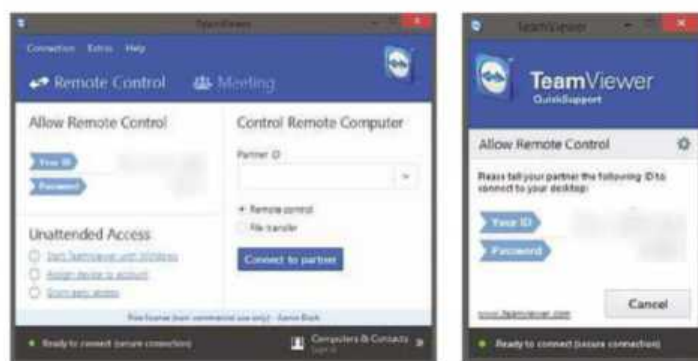
There are, indeed, a lot of options available when it comes to RDP (Remote Desktop Protocol) software for the PC, and you've got a lot of avenues open to you. Luckily, some of the best options here are free, including the package I'd recommend – Teamviewer (www.teamviewer.com). Available as a paid for package for commercial use, the program is free for home use, so should fit the bill here.

“ Teamviewer is easy to setup on your end, and even easier on the user end ”

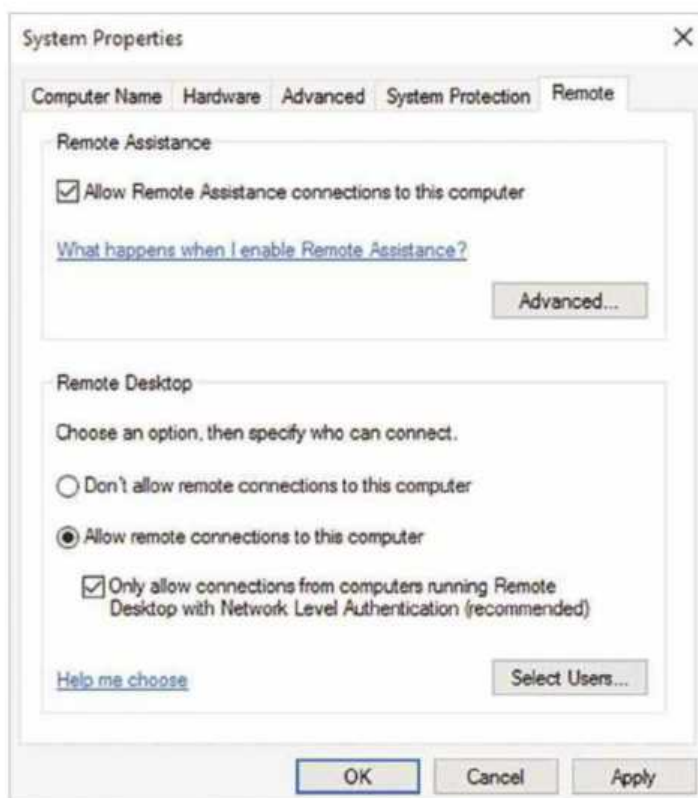
Unlike a lot of alternatives, Teamviewer is very easy to setup on your end, and even easier on the user end. There's minimal to no system configuration, and once connected you'll have full control of the target PC.

All you need to do is visit the website and download the package from the website and install it. Then, your target user simply visits the same website and clicks the option to join a remote control session. After a small download, the target user will be given a user ID and password, which can be relayed to you. Enter this information into your Teamviewer application and you'll connect to the target PC. Easy. Control will be enabled, and you can also use features like file transfer and chat to make the process even easier.

There are, of course, many other alternatives to this option – such as Join.me, VNC, and GoTo Meeting – but I find Teamviewer to be the best all-round solution, not to mention cheap, and the one that's simply most effective for the majority of tasks (especially when it comes to offering support). It also bypasses most security, so firewalls and other potential blockages are not usually a problem.



▲ Teamviewer is a great RDP application that makes it easy to connect to and control another PC



▲ Windows 10 has built-in RDP, but you'll need the Pro version to allow access to your system

However, if you'd prefer to avoid any extra software, Windows 10 does have its own built-in remote control software (only Windows 10 Pro can allow access to itself, though). To access this all you need to do is go to Start and search for Remote Desktop Connection. Access this and you'll be able to enter the computer name to connect to it.

Your target user will need to supply this name or IP address, though, and also set the system to allow connections. For the former, users will need to right-click Computer and go to Properties and then Remote settings. Here they can add users to the list of authorised connections.

Next, they'd need to provide their computer name or IP. To do this, they'd need to select to right-click Computer and then go to Properties. Here they'll see the computer name. To find the IP it's best to use an external service as you'll need to outside-facing IP address, not the internal network one. It's easy to find this, simply use a service like IP Chicken (www.ipchicken.com), or simply type 'What's my IP?' into Google, to be shown your public address.

ASK JASON



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While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Power Trip

My present graphics card is a GeForce GT 740, which isn't up to much on recent games, especially at 1440p (which my monitor supports). As a replacement, I'm interested in the new Radeon RX 480, which looks unrivalled in the sub-£200 bracket (particularly the 8GB model). However, I'm reading reports of possible power problems (even on the 4GB model). Is there any substance to these? Could my PC become damaged?

R Mackenzie, Cumbria

*This is a hot topic at the moment, and 'hot' is definitely the right word. First, some basics. * A PCI Express graphics slot is designed to deliver up to 75W of power. Most of this comes via the +12V line, which provides up to 5.5A of current – that's 66W (12 × 5.5), or 71.2W if the +12V line's permitted ±8% tolerance is included (12.96 × 5.5). Smaller values are added in from the +3.3V and +3.3Vaux lines. The RX 480 has a six-pin auxiliary connector too, which also delivers up to 75W of power.*

Now, open your book at page 1 of goo.gl/E2Md2B, an

analysis at Tom's Hardware. Repeated tests on an RX 480 showed that everything with the six-pin auxiliary connector was fine and dandy, but the current drawn from the PCI Express slot was 6.74A – nearly 23% above spec. On the +12V line alone, the card was sometimes gobbling between 80.88W (12 × 6.74) and 87.35W (12.96 × 6.74). Oh dear. Tests by other tech sites have reached similar conclusions.

So could the RX 480 cause damage? I'd say it's possible. Some motherboards, probably older or cheaper models, don't appear to like this extra load on the PCI Express slot one little bit. See this YouTube video: goo.gl/gY4v6B. The fellow there witnessed his PC regularly shutting down during gaming. This didn't happen with a card other than the RX 480, and it also didn't happen when the RX 480 was plugged into a different PC. Are you feeling lucky?

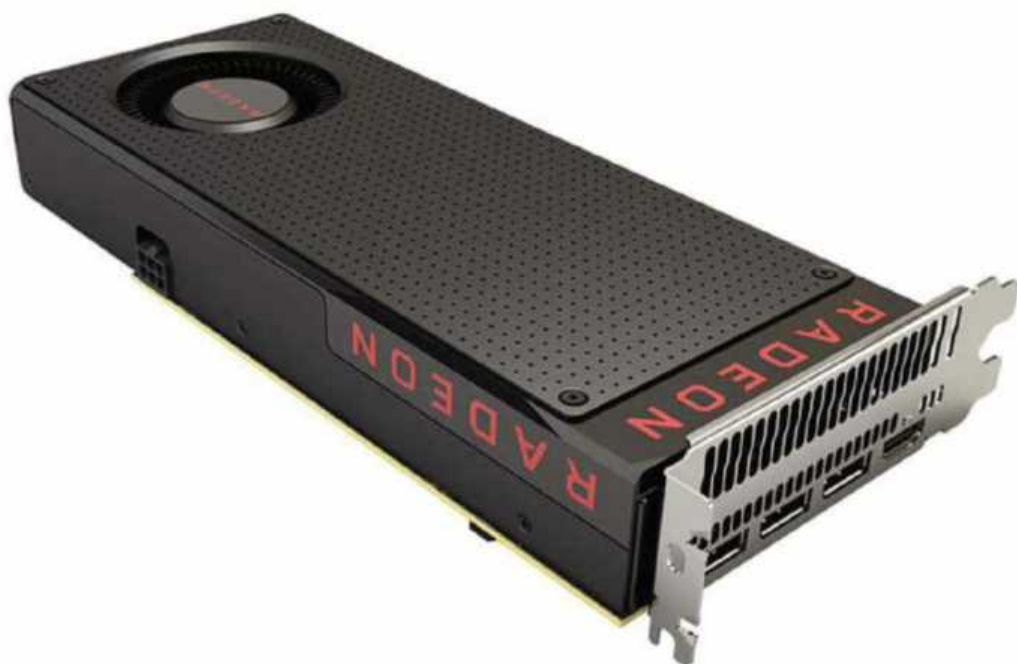
I'm staggered that AMD has put the RX 480 on the market in its current state. Company representatives say the problem can be rectified in a driver update, and I bet they also

say they can pull rabbits from hats while walking across San Francisco Bay. A driver update will probably just lower the GPU and RAM clocks, or throttle them when the going gets tough. That's not a solution. That's a fudge.

No, I can't foresee that anything less than a firmware update will fix this. I wouldn't be surprised if the card layout needs to be redesigned. I suspect custom cards – the current models are all AMD reference jobs, regardless of the manufacturer – will be somewhat modified. Many will probably feature an eight-pin auxiliary connector, good for 150W. Personally, I'd wait for these before opening my wallet, especially if I were planning to overclock.

** I've simplified the electrical stuff somewhat. This is mostly out of necessity, as it's not my field of expertise (I've yet to discover my field of expertise, truth be told). I can't wire a mains plug without following pictures.*

▼ **Has the Radeon RX 480 been released before it was ready?**



No Location, Location, Location

It's time to upgrade my Nexus 7 tablet (a 2012 original), and I've decided to get an iPad Mini 4. Yep, I'm bad, bad, bad – I'm switching from Android to Apple! Does the Mini 4 have GPS, though? Some websites say it does; others say not. Wikipedia in particular seems to give contradictory information. GPS is essential, as I'm a keen walker and take my tablet with me for navigation.

Nick, Gmail

The Wikipedia entries for mobile devices are usually pretty accurate but sometimes incomplete. For easy-to-digest lists of specs, you may do better visiting www.gsmarena.com. I can tell you without looking, however, that the only iPads with GPS are the cellular models – those supporting 3G or 4G.

Apple's thinking is that GPS requires maps, and downloading maps requires an internet connection. For folks outdoors, splashing through a babbling brook on a Welsh mountain and munching Kendal mint cake, wi-fi is less effective for data transfer than two tin cans and a length of string (to be fair, 3G or 4G may not fare much better!). To Apple, cutting GPS from wi-fi-only iPads probably seems justified.

But it's not. Many map services, including Google's, allow maps to be downloaded in advance, meaning GPS remains useful even if a device is offline. Maybe you've been putting this into practice, Nick.

In short, if it's an iPad Mini 4 you want, buy the 4G version. Perhaps that's already your plan. You'll be clobbered by a 25%–30%



▲ If you're about to buy a phone or tablet and need to confirm the specs, point your browser at www.gsmarena.com

premium, of course. For example, the 16GB wi-fi model costs £319; add 4G (unlocked) and you're talking £419. And you'll probably also want some sort of service from a carrier.

Bear in mind that tablets from other manufacturers almost always feature GPS regardless of the absence or inclusion of cellular connectivity. Also bear in mind that the iPad Mini 5 is due in September (most likely without a 3.5mm headphone port, absurdly). Maybe stick with your Nexus 7 for a couple more months?

Slow Coach?

My two office PCs are self-built mini-ITX jobs. I prefer a wired network instead of wi-fi, so I use the motherboards' built-in 100Mbps Ethernet ports. My router, though, has 1000Mbps ports, so I reckon I'm needlessly holding the network back, especially where the internet connection's concerned. I'd like to fit gigabit Ethernet cards, but the motherboards only have PCI slots – there's no PCI Express. Is the PCI bus fast enough to make the upgrade worthwhile?

Alex, Gmail

Gigabit Ethernet over copper cable predates PCI Express by some years (1999 versus 2003), so originally the good old PCI bus was typically the only game in town (server hardware had PCI-X).

1,000Mbps or 1Gbps equals 125MB/s (divide by eight), and a PCI slot provides 133MB/s (minus some overhead). So far, so good.

However, the big limitation of PCI is that it's a single bus, shared between all devices wired into it. PCI Express is a point-to-point architecture, so each device has access to the full bandwidth – nearly 1GB/s per lane for PCI Express 3.x – regardless of how many devices there are.

Back in the day, such a limitation could certainly be a bottleneck on system performance, as some users were apt to have a PCI card plugged into every slot. But I'll take a guess that the only PCI device in your system, Alex, is the motherboard's sound card (ignoring the 100Mbps Ethernet port, which won't be seeing action). This isn't in a slot but is still attached to the PCI bus.

The upshot is that by fitting a PCI card your network bandwidth should increase to around 100MB/s – maybe 25% less than gigabit Ethernet's full potential. Not bad. Not bad at all. Would

you notice, though? Unless your internet feed comes in beyond 100Mbps – I know Virgin Media offers 200Mbps – even your current setup is up to snuff. That provides 12.5MB/s, if you want to compare all the numbers.

Gigabit Ethernet will really only come into its own if you're transferring big files, or big groups of files, from one system to another. Even there you'll need SSDs to keep up with it – the fastest spinners on the market won't write 100MB/s or more of data for longer than quick bursts. But it's all moot, I guess. Gigabit Ethernet PCI cards barely cost a fiver apiece, so you may as well just go for it.

▼ 'Swap over the two black ones, you say?'



Crowdfunding Corner

This week, we've got a pair of connectivity projects: one for adding old connectivity to a new device, and another adding new connectivity to an old device...

RB-Connect Ethernet for iOS

Apple's rush away from 'old' technology means there's no official support for Ethernet ports available for iOS devices – which is fine if you've got adequate wi-fi coverage, but not if you're using a wired network (whether by design or necessity). The RB-Connect is an accessory aiming to bridge that gap.

Connecting directly to, and powered by the lightning port, the RB-Connect has a USB port at one end and an Ethernet port at the other. Plug the device in, disable your wi-fi and mobile connection, and in four to six seconds it'll acquire a 100Mbps wired connection from the adaptor. No additional software is needed, and it works just like any other connection. As well as being useful in spotty wi-fi areas, it provides more reliable speeds and security, in addition to extending battery life.

If you want an RB-Connect, you can get one by pledging 99 (£85). The project is aiming to hit a goal of 9,999 and has already reached 30% with more than three weeks left to go at time of writing, so we fully expect to see it hit its target – but nothing's certain, so do go and back it if you think it'll be useful to you. Delivery of the units is estimated for September 2016.

URL: kck.st/29mBx1k

Funding Ends: Tuesday, 2nd August 2016

Das Keyboard 5Q

Kickstarter has been home to many different quirky keyboards, but the Das Keyboard 5Q is certainly one of the stranger examples. This cloud-connected keyboard comes with its own API, which allows each of its under-key LEDs to be colour-controlled over the internet.

The idea is that by using the open API to build apps, companies, organisations and applications will be able to notify you of changes in their status by altering the colour of keys, lighting up like a car dashboard to alert you. You could display a long rendering process as a progress bar on one row of your keyboard, or make the appropriate number key light up to show you how many new emails you have. Alerts can be ambient or one-off, so you can dismiss them or leave them there to refer to at a glance.

The keyboard itself doesn't skimp on quality either – it has high-end mechanical switches that make it perfect for typing and gaming, as well as laser-etched keycaps, a 105-key layout and bundled software.

If you're after one, you should be able to get in at the last early bird tier and pay just \$129 (£99), but if you miss that, the \$159 (£122) tier is sure to be open too. Higher tiers give you access to extra keycaps (including fully translucent versions). The project had already surpassed its initial target three times over, so there's no doubt it's going to be big. Units will (hopefully) ship in January 2017.

URL: kck.st/29i6DLK

Funding Ends: Saturday, 30th July 2016



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

MS ISO Download Tool

Can't find those pesky Windows images? We have an app for that

Most users will rarely need to look up the disc images for Windows or Microsoft Office. Usually, should their PC need a rebuild, the user will opt for the recovery partition that came with their PC, or they'll have a rescue disc that was also included when they bought the machine.

However, there are times when some users will need the .iso for Windows or Office and getting hold of those .iso files isn't always as easy as it sounds.

It's true that Microsoft does have them available for download through a section of the main MS site, but they're often quite difficult to locate, and they have the annoying habit of being moved around within the complex organisation that is the Microsoft web presence.

Thankfully, though, canny developer Jan Krohn has an easy solution for those wanting to get hold of the images: the Microsoft ISO Download Tool.

Direct Downloads

The tool works by pulling the disc images down directly from the Microsoft servers,

working with Microsoft TechBench – a lesser known portal that provides documentations, scripts and other tools to help install Windows and Office.

This handy 300KB tool may look pretty simplistic, but for those of us who install Windows and Office version regularly, it's worth its weight in gold. Presently, you can download Windows 7, 8.1 and 10, and the Windows 10 Insider Preview. In terms of Office, you can get hold of Office versions 2007, 2010, 2011, 2013 and 2016.

All you need to do is select the OS or Office version from the list on the right, then follow the on-screen prompt in the main window. Once you've selected the version (Home, Professional, Ultimate and so on), you'll be given a link that'll be valid for 24 hours from the time of creation.

The links available can be for both the 32-bit and 64-bit versions of the software and, when ready, you can press a button to copy the link and access it via a standard browser or through the main window from within the ISO Download Tool.

Features At A Glance

- Free.
- Only 300KB in size.
- Easy access to Windows and Office 200 .iso files.
- Download any version or language.

Small, But Effective

While it may not set the app world alight with its genius, the MS ISO Download Tool does relieve the headache of having to locate the .iso files for the current active Windows and Office installations.

The links can be copied and pasted into an email for a remote worker or technician, and the program doesn't require any installation, so it can be run just as well from a USB stick if needed.

For more information on which versions of Microsoft products the tool can access and to get hold of the executable, visit goo.gl/fo0pkp. Of course, it's worth mentioning here that you'll need a valid code from Microsoft to install or use the products permanently. mm



▲ Select your OS or Office software



▲ Choose your version and language



▲ The MS Download Tool will then provide you with an active link to get the .iso

Logging Off

In our increasingly connected world, it's becoming harder to know what's real versus illusory. And to complicate things further, people can be fickle creatures that love something one minute and hate it just as fervently seconds later.

Reality, it appears, is a fleeting shadow cast from a distant source, the origin of which is open to the widest interpretation.

A classic example of this is a petition calling for a second EU referendum, which in the hallowed traditions of that bureaucracy

demands that we vote again, presumably till we get the answer right.

What was odd about this petition is that it was actually started long before the result had been cast in May, by a person who now says they assumed the vote would be to remain, confusingly.

At the time of writing, this petition is the most signed of any on the Government Petitions website, with 4,081,038 signatures.

I'm not sure how that trumps the referendum, in which 17.5 million people voted to leave, but it's an impressive number all the same. Or is it?

Regrettably, vast numbers of people who signed it appear not to be UK residents, and technically only British citizens or UK residents are permitted to sign the petition, including Britons based abroad.

It could be argued that all those British people living in the EU are concerned about what happens to them after Brexit and have added their names, but unfortunately those numbers don't really add up.

Since when was North Korea in the EU, or do 23,000 British ex-pats live there? I think it's safe to say that they don't. And 39,411 don't live in the Vatican City (not in the EU either), because the total population of that theocracy is just 450, by their latest records.

For those wondering how so many people signed this, including a 90,000 block made in the middle of one night, the answer might be disappointing

Let me be clear, I'm not saying for one moment that there aren't real signatures in here or that those who signed it didn't believe in continuing this debate, but there are others that are patently fraudulent. Those overseeing the petition site have already binned 77,000 of them because they're



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Top 5

Reasons PCs Are Better Than Consoles

Who needs a PlayStation or Xbox anyway?

1 Upgradeability

Is your PC feeling a bit sluggish? Is it running out of storage space? Then just buy some upgrades and stick them in your case. Now your computer will run better than before, without you having to buy an entirely new system. Great, isn't it?

Console owners, of course, don't get this privilege. They might be able to replace their hard drive, but that's about it, so if a game doesn't run well, then it's a case of waiting for a patch to be released, because there's pretty much nothing else they can do.

2 Mice

Have you ever played a real-time strategy game with a console controller? It's possible, but it's certainly not fun. If you want to select things with any kind of accuracy, then a mouse is the only way to go.

And if you're a first-person shooter fan, then you'll know just how much easier these games are to play with a mouse. You see a thing, so you point at it and shoot. With a gamepad, you push a stick and then wait for the cursor to get where you want it to be. No wonder they need 'aim assist'.

3 Keyboards

Going hand in hand with the mouse is the keyboard. As a game control system, it's not amazing for action games, but it does work. However, that's not what's great about having a keyboard. The main reason why it's better is, as you might expect, because you can type on a keyboard.

Want to enter your name in a high score table, or do you just want to search for something in Netflix perhaps? Great, because you can just type it in, without having to use some horrible, fiddly on-screen keyboard that will make you question your will to live. (Of course, you can now use keyboards with modern consoles, so this is less of a plus point than it used to be.)

4 Personalisation

As we at Micro Mart get older, we find ourselves spending less and less time worrying about what's on our desktops or what our icons look like. But if you are into such things, then the PC offers the greatest

amount of personalisation options and the easiest path to put them in place.

Just about every aspect of how your computer experience looks and feels can be tweaked. Some changes can be made with your operating system's built-in functions, but there are also plenty of third-party tweaking tools too – not something you'll find with locked-down consoles.

5 Flexibility

Closely linked to personalisation is flexibility. You can use your computer for so many more things than you can a console. As well as a games machine, it can be a work system too. Or you could just turn it into a media server or NAS. With a PC, the sky really is the limit.

And if you want, you can completely change the operating system. You could follow the vast majority and use Windows, but Linux offers a great alternative and, if you don't mind upsetting Apple, it's even possible to run OS X. Plus there are even more obscure operating systems you can try, if you're willing to give them a go. [mm](#)



▲ To be fair, this never happened with our PlayStation...

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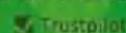
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